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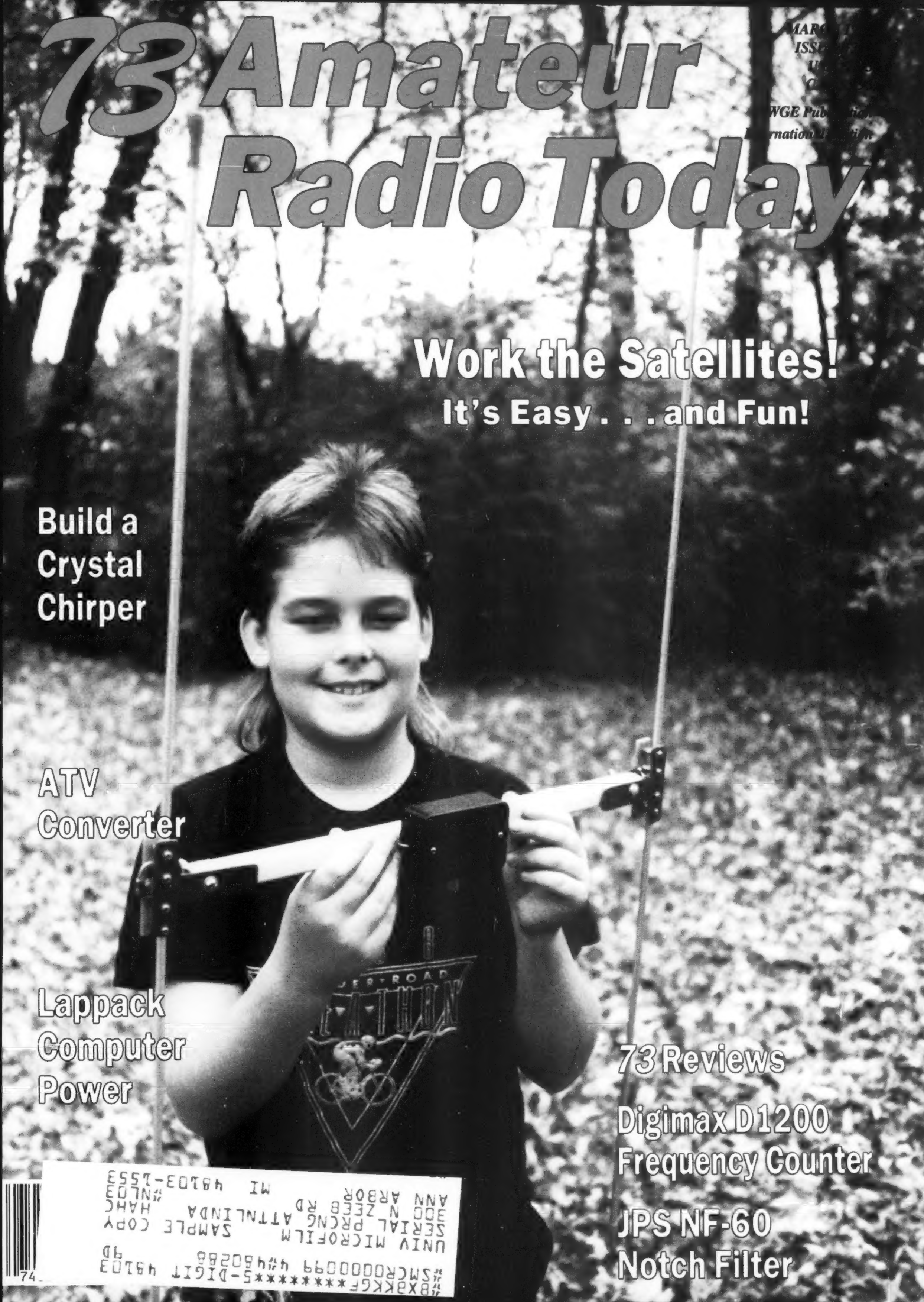

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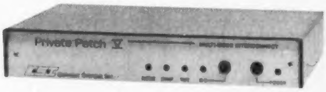

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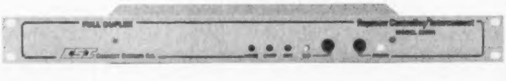

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LETTERS

From the Hamshack

Nestor Noy N2OGC, Union NJ I enjoy your columns a lot and your "Never Say Die" column is numero uno. Recently I've become a codeless Tech, and now I'm working on CW, the outdated requirement, to upgrade. Just because someone had to learn CW "ages ago" doesn't mean we have to learn it today as a requirement. Technology has changed, for better or worse. Perhaps CW could continue for those who enjoy it.

As far as saying that codeless Techs will make a mess of the bands, that is not true. The bands are a mess now. There is talk on how the ham bands will become like the CB band, but I doubt it. Perhaps some of you should monitor the CB frequencies and listen to the professional way in which a lot of CBers conduct themselves on the air.

Instead of bickering and blaming people, let's start to use some manners like the hams we are, and welcome newcomers to the bands. How about using your knowledge and experience to help newcomers set up their stations, and build or repair equipment? But please do not take your knowledge only to your grave.

Dave Gerrard VE3VID, Eganville, Ontario Read your editorial "Never Say Die" a few months back about falling asleep at will. On trying your technique I repeatedly found that I'd fall asleep in the middle of the whole thing. Do I still owe you a subscription? Hi, hi.

I get a kick out of the way you bash the standard issue rhetoric still upheld by the moldering old guard of CW—and all the slogans and banners they still wave in honor of its preservation.

I am a relatively new licensee, but not new to the hobby, having several licensed family members. Two days ago I upgraded to the 12 wpm level with the assistance of the 12 wpm code tape from your "bookshelf." I practiced with the 6+ wpm tape until I felt I could easily master our 5 wpm exam, but upon sitting for the exam, I found that the text sounded too slow and thumping.

The examiner then sent me the 12 wpm drill, just for fun, and that's when suddenly the chickens came home to roost. Five minutes of CW copying never were so smooth.

All I know is that the 6+ tape must have easily been 12 wpm with characters sent at 15. Hmmmm . . . was this some kind of well-planned deception, or just an accident?

Who cares? I intend to pass on my practice tapes to some other poor, unsuspecting no-coder and see how he likes getting his 12 wpm endorsement when he sits down to do the fiver.

Dave, the characters on my tape are sent at 13 wpm, but are spaced to bring the net speed down to 6 wpm. The whole idea is to make it so you only have to learn the sound of each character once. That's why this system is so easy compared to the others.—Wayne

Kennon A. Smith W4TKI I just finished reading your December issue of *73* from cover to cover, and congratulate you on a job well done. I always read your editorial with some ambivalence; I find it both angering and stimulating. I don't agree with it all, but you cover areas where I believe hams should be stirred up. So keep up the good work. I applaud most things that encourage free thinking against an entrenched bureaucracy.

I think your construction articles are good, but I would like to see more inexpensive projects. Your two articles on the Ramsey kits were the kind I like to see.

I also like the thoughts on DXpeditions. They are very fine, but so far due to my finances I have had to enjoy them vicariously. I really get a thrill out of working DX, but I enjoy it more when I get a chance to know the fellow on the other end of the line.

One thing I don't approve of is your putting down us older folks. Older folks can have imagination, and it doesn't take old age to make a person vegetate. Why I said this is because I am over 50 and it kind of hits home.

Ken, sure a few of us old fogies do things, but most of us need a good kick in the slats to get us off the couch. At 69 I'm scuba diving, skiing, piloting a 747, at the helm of a nuclear hunter-killer submarine (SSN-677) under the Pacific, and raising holy hell with my state government, and just finished my new recording studio. At "over 50," you are too short of money to make a one-week DXpedition to the Caribbean! Jeesh. Meanwhile put together some kits and write 'em up for us. —*Wayne*

Mark F. O'Brien N8PQJ, Ann Arbor MI I am one of the new "no-code" Techs, and I have enjoyed reading *73*. What prompted me to become a ham? It was my initial interest in putting radio telemetry and amateur TV payloads on "model" rockets. When the codeless Tech license became available, I decided it was time to give amateur radio a try. It really wasn't that difficult studying for the test, and during the eight weeks I waited for my license, I learned an awful lot about the hobby (and there is still so much to learn). I'm active on 2 meters, and enjoy packet radio. I have also been building some small 2 meter transmitters from plans that appeared in recent issues of *73*. These will become rocket payloads sometime in 1992.

I have talked to many codeless Techs, and there is a lot of interest in 6 meters, but little equipment is available. Perhaps there are some manufacturers, such as Ramsey Electronics, that would market a 6 meter transceiver if they knew there was a lot of interest, or maybe there are some talented hams out there who can submit a plan to *73!*

Jeffrey L. Wheat N6ZYX, Norton AFB CA I have been trying some new things in ham radio, some inspired by something you wrote over the past year or so. I have been teaching a Novice and no-code Tech class for any age group (kids are very open-minded, as well as fun to teach), but yesterday I got to give a Novice exam to a Handi-Ham. A friend of mine, Mark KJ6H, asked me if I would mind helping him with the exam for Jerry. I got a kick out of being able to sign that 610, even more than any time I passed an upgrade.

John Roessler KB6WB, El Cajon CA I generally do not write letters to magazines, and am considered a member of the quiet majority. But I must put my two-cents' worth in on a subject that I have noticed a lot of complaining about lately.

That is "Codeless Techs" complaining about brushoffs, etc., on the air. I don't know how it is in other parts of the country, but I know in this area I personally haven't noticed any bias or prejudicial remarks over the air concerning "Codeless Techs." In fact, one doesn't know if a person is codeless or not unless the person so states.

Our club, the Amateur Radio Club of El Cajon, has approximately 325 members, and all classes of amateur radio operators as well as nonlicensed people who are interested in amateur radio. In fact, when a licensed operator joins our club, he/she is issued a WAMO number. This means "Worked All Members Once." We have a net every Wednesday and Saturday evening in which club members meet on the air and exchange WAMO numbers.

Our ARES division here in El Cajon boasts members of all classes. At the various functions we have worked in complete harmony. Our club holds classes for all phases of the license requirements for anyone who wishes to obtain a license or upgrade. I am a member of the SANDARC VEC, and when an individual passes an examination, he/she is congratulated when handed the CSCE. Not all of us "ole fogies" are sitting on our duffs complaining about "codeless Techs."

Sounds like the Amateur Radio Club of El Cajon is one of the good ones. Keep up the good work. Unfortunately, yours is not a common experience. I have heard nasty remarks about Technician class hams on HF, and on dozens of repeaters all across the country. I've even seen negative messages on packet. We get letters every day from new Techs, telling us about how the local hams have treated them badly. Your WAMO net is a great idea. Why don't you write up an article about how your club is welcoming newcomers. Take a few photos and send it in to Radio Fun. *Other clubs would do well to follow your example.*

—*David N1GPH.*

Randy Van Voorhis KD4DWF, Bartlett TN I'm writing regarding your editorial in November. I have the entrepreneurial "bug" that you speak so much about. I would be interested in finding out more about how to give the two ARCs I am a member of a kick in the butt. They both have good intentions, but working independently of each other, they are unable to get as much done as they could in a joint venture.

The Delta ARC and the Mid-South Amateur Radio Association, W4BS and W4EM, respectively are both thriving clubs, with the Delta ARC just passing 350 in membership. All of the "old fogies" roll into the meetings, say hello to one another, and leave, not even introducing themselves to the MANY new hams trying to be accepted into their group. If some of these folks would smile and offer their knowledge as an elmer, the Memphis area would be unstoppable. As you touched on in the November issue, PR is desperately needed at the local level. In *QST*, I read where a long process to hire a PR person and a PR firm are finally over, but each club needs to promote as much as possible. If I had not known Lane O'Daniel WB4DNX for 15 years, "hamming" would not even be known to me. I have only had my license since August '91, and didn't realize how hard it would be to motivate a group of people who are supposed to be "enjoying" their hobby. If it were not for a *few* ambitious members, the clubs would probably all but die out.

I have my no-code Tech, but my goal is amateur Extra by the end of 1992. I am a big fan of yours even though I have only been introduced to you through *73* in the past several months. If I can manage to get the people that went through the Delta ARC licensing class with me together, I will get a picture to you. We have had a very large response to the no-code license here in the Memphis area, and are having regular classes.

Yes, I know there is only one *73*.

James D. Toews VE7EMP, Prince George B.C. I just received my December *73* in the mail today, and as usual I read your editorial first, and then the "Letters" column, which is (as it normally is) full of letters patting you on the back. I have never before written an editor of a magazine, but I felt compelled to write you because, well, you're right! We all have to do something to help the hobby and the new hams getting into it. In Canada we have had a no-code license class for a year now which has doubled the amount of active hams in Prince George on the 2 meter band. These new hams are, in my opinion, as good in amateur operation as anyone else in town. They are courteous, eager to learn code eventually, and most important of all, ACTIVE! I am a fairly new ham myself. I have been licensed three years, upgrading to Advanced class two years ago, so I can still remember how a newcomer feels coming on the scene and not getting a 100% welcome feeling from the old-timers.

One thing a new ham has to realize is that there are some people out there who will never make you feel welcome, no matter how hard you try. Take Wayne's advise and forget them. Get a bunch together and form your own club; that way you will find you can get things done and not have to pack along any dead weight.

Prime repeater mountaintop land became available a while back, and the existing ham club couldn't see what a resource this was. Five of us met and decided to form the Prince George Radio Experimental Society. We applied to the government, were granted the land, and we established an HF radio contest station (VE7EPG) and a repeater site (VE7RES) which is linked all the way north to Fort Nelson, 518 miles north of Prince George, making it one of the longest ground-linked systems in the province. Our group has done a high altitude balloon launch which reached 100,000 feet, and was heard over 450 miles away. We are now at 12 members in less than a year, and looking at establishing an ATV repeater at our mountain site. This was all done by hams licensed three years or less. So next time you are at your club's general meeting, and your ideas are harped at by the "old-timers," form your own club and get something done.

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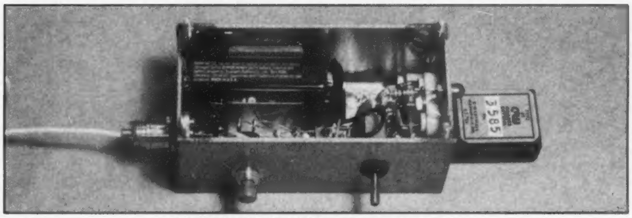
Cover: Jason Pelaez N8NDQ with his DF antenna. See "Homing In" on page 70. Cover photo by Dave Pelaez AH2AR.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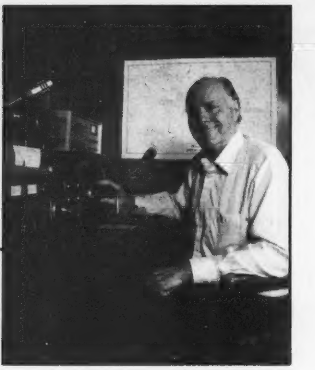


The Worrywart At Dayton

With Dayton looming a few weeks away, it's almost time for me to start thinking about my talk. Of course I say this to myself every year and I follow the same pattern each time—I put off thinking about it. Then, suddenly I'm addressing a roomful.

I'm reminded of a Japanese pianist friend who is so good that he doesn't have to practice much to get by. The result is that he gets by at concerts, but when it came time for him to make a recording where he had to be perfect, not just darned good, he was in trouble.

Having done just about everything there is in amateur radio; having DXed from dozens of countries; and having been writing editorials for 40 years now, I don't have any problem getting up in front of an audience and talking at length. But like my Japanese friend, I've been taking the easy way out and not planning my talks before I get started.

What should I talk about at Dayton this year? No-code? Old-timers? Our mess on 20m? Ham broadcasting? WARC? Digital voice? The loss of our consumer electronics industry to Japan? The pathetic vapidness of our QSOs? Our thousands of virtually unused repeaters? Fixing our American educational system? There isn't anything much I can talk about that I haven't written about in my editorials, so I don't know.

With technology rapidly leaving us far behind, I wonder if you have any ideas on how amateur radio can even pretend to be worth continuing as a hobby which might be worth airing at Dayton? As I write this I'm just back from the Winter Consumer Electronic Show in Las Vegas. There I heard about the latest in DSP, CDI, DCC, DAR, MD and other technologies of the '90s. As I looked over the new equipment and attended lectures, I wondered how many hams in my Dayton audience would be able to identify these new technologies by their letters? And how many could explain them at a ham club meeting?

The world is going into desktop publishing, home video production systems, pocket cellular phones which plug into your car, arcade quality games at home, notebook computers, and pocket faxes, while we're fighting over the Morse code...which to me is like arguing about deck chairs as the Titanic sinks.

Microelectronics has made it impossible for us to build anything but the most simple equipment. It's time to stop fussing about that. So what role is there for amateur radio in the next century?

The original justifications for our hobby have been made irrelevant as technology has swept past us. I suggest we either come up with some new and compelling reasons for our use of billions of dollars in public property or else contemplate eviction.

We were at one time supposed to provide a source of technically trained people in case of a wartime need. We're no longer able to even remotely cope with today's technology, so that's out. Worse, today's military "technicians" are being taught to replace boards by the numbers, not to fix them.

We're supposed to be able to provide emergency communications. We still do this to some degree, but cellular telephones and other more modern communications technologies are fast making us redundant. There's no comparison between high-speed digital communication technologies and our slow, error-prone CW traffic networks which the League is still promoting.

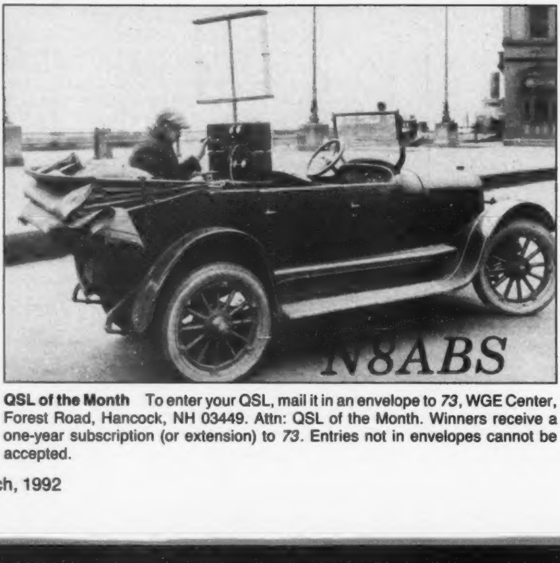
We're also supposed to be providing international good will. We still do, a little. But our demand for contacts and QSLs from rare countries has killed that benefit. We'll be hearing about that at WARC, you may be sure. Amateur radio is perceived to be no more than a hobby for rich Americans and Japanese by many third world governments.

At Dayton this year, can you come prepared to explain briefly what benefits you think we have to offer America...and third world countries? What justifications have you for our continuing to use our priceless frequencies?

I'll have to put a time limit on contributions as a way to keep some of the long-winded 75m geezers from pontificating at length. I'd like to hear from hams who have good ideas and can express them.

Instead of my giving a talk this year at Dayton, how about a workshop where we discuss what benefits we can offer in exchange for the value we're getting?

Think of our hobby as a product. It has to be good to attract buyers (newcomers). It has to keep up with the times. It has to provide benefits to the country in exchange for its franchise for exclusive use of public property (our frequencies). It also has to be promoted and advertised if it's going to attract customers. And we have to have some sort of customer service to keep the customers happy (presumably the ARRL).



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We're weak in every aspect of our marketing. We do little to promote the product. We do even less to advertise it. Customer service? Har-de-har! We've been paying the bill to our supplier (the government) with IOUs.

We have what could be a fantastic product. We could even pay for it with services. I'll be interested at Dayton to see if you come to my talk and just sit there...or if you come with ideas on ways we can pay the freight...with ideas on how we can better promote and sell the product.

I have plenty of ideas...some of which I've outlined in my editorials...but I have no monopoly in this field, so let's hear yours. I've got up to 90 minutes allotted...time for a good 50 ideas to be proposed.

The Old Days

The days when hams could build their own equipment are long gone. Most of today's electronic circuits are just too complicated for the kitchen table. Sure, it's fun to put together kits...and I encourage it...but with almost all parts being made in Asia and few parts sellers left in the U.S., our days of building state-of-the-art receivers and transmitters are long gone.

The day when the military might suddenly be in need of radio operators is history. That meant something when the military communications used Morse code and they didn't want to have to take months to train operators. Even the best of our technical training is no longer of value to the military. Our experience has little relevance when it comes to operating or repairing military electronic equipment.

The military also supported us in days of yore as a way to reserve a body of frequencies they could commandeer in time of war. They don't need those any more either.

All of which leaves us with a sack of nuts.

One benefit we might be able to provide would be a growing pool of young electronic enthusiasts who would go on to become technicians, engineers and scientists. We know that America is either going to somehow develop high-tech career people or else we're going to continue to lose the world economic battle.

But we're going to have one hell of an uphill battle. We have our whole educational system and its unions to fight. We even have a large percentage of our own hams fighting to keep youngsters out.

If you think I'm wrong in any detail, please put your word processor (even if it's a pencil) where your mouth is and let me know how you think I'm off base.

KENWOOD

Compact Champion!

TH-27A/47A

2 m and 70 cm Super Compact HTs

Here is a great new addition to Kenwood's HT family — the all new TH-27A for 2 meters and TH-47A for 70 cm! Super compact and beautifully designed, these pocket-sized twins give you full-size performance.

- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
- **Extended receive coverage.** TH-27A: 118—165 MHz; TH-47A: 438-449,995 MHz. TX on Amateur bands only, (TH-27A modifiable for MARS/CAP. Permits required. Specifications guaranteed for Amateur bands only.)
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Built-in digital clock** with programmable timer.
- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!
- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)
- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

Optional accessories:
- **BC-14:** Wall charger for PB-13, 14
- **BC-15:** Rapid charger for PB-13, 14
- **BH-6:** Swivel mount • **BT-8:** Six cell AA Alkaline battery case • **HMC-2:** Headset with VOX and PTT • **PB-13:** 7.2 V, 700 mAh NiCd pack • **PB-14:** 12 V, 300 mAh NiCd pack • **PG-3F:** DC cable with filter and cigarette lighter plug • **PG-2W:** DC cable
- **SC-30:** Soft case • **SMC-31:** Standard speaker mic • **SMC-32:** Compact speaker mic
- **SMC-33:** Compact speaker mic with controls
- **WR-2:** Water resistant bag.

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

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Specifications and features are subject to change without notice or obligation.
Complete service manuals are available for all Kenwood transceivers and most accessories.

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KENWOOD
146.97
REP
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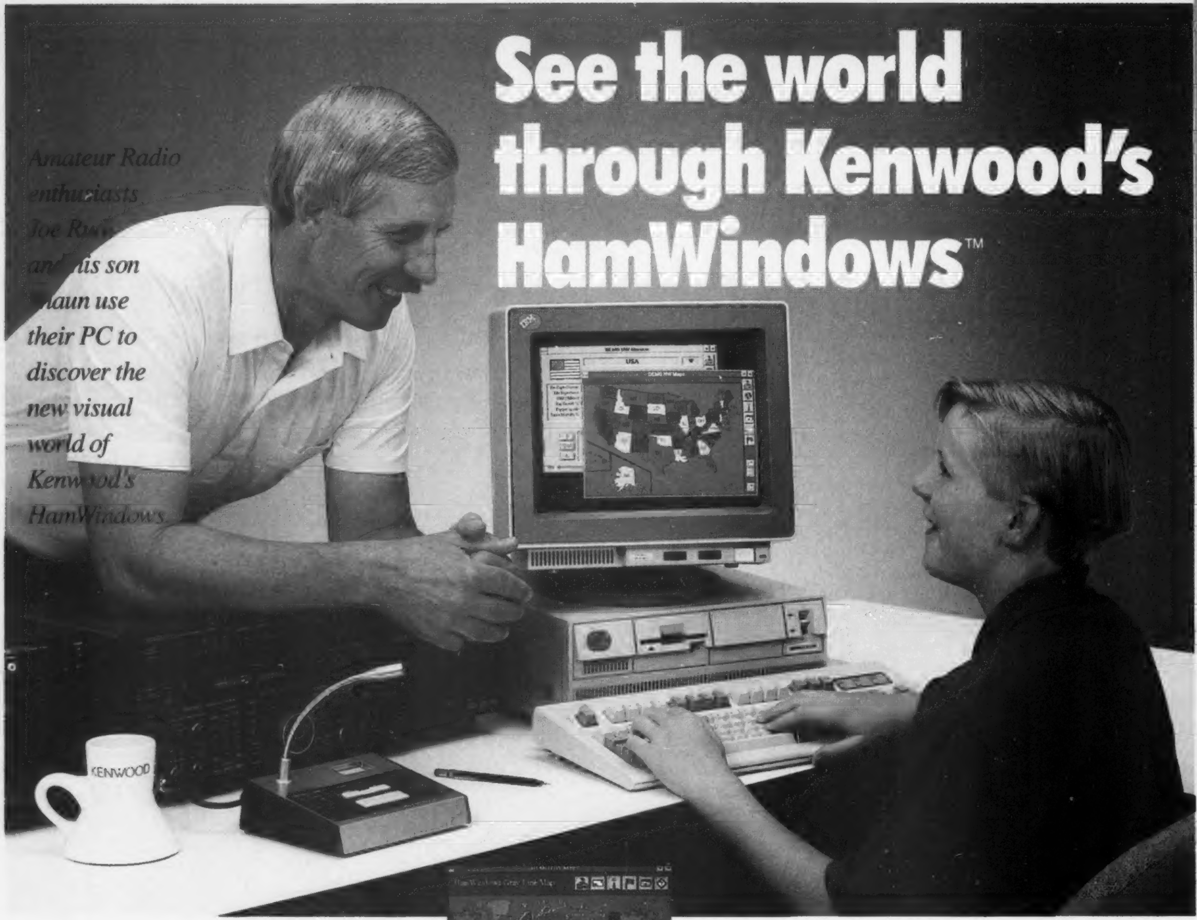
MORE
FM TRANSCEIVER



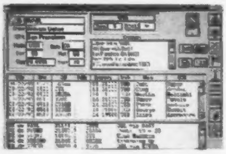
See the world through Kenwood's HamWindows™

Amateur Radio enthusiasts Joe Ru and his son Shaun use their PC to discover the new visual world of Kenwood's HamWindows.

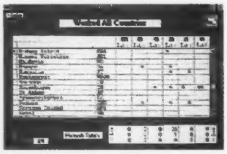
HamWindows Gray Line Map

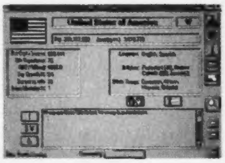
HamWindows™ is an all new concept in the world of Amateur Radio.

This program pulls together eight full color “windows” including transceiver control, station log, world almanac, awards tracking, SWL data base, greyline maps, regional world maps, and packet TNC control.



Using a mouse to “point and click” HamWindows™ lets you see the world your transceiver hears. Use the almanac to learn more about the countries you contact, and then add the QSO to the logging program. You'll automatically track contacts for the DXCC award. The SWL data base lists thousands of frequencies and schedules from over 9,000 broadcast stations. And the greyline and regional maps put the world at your fingertips. With the proper interface you can even control your Kenwood HF transceiver.





HamWindows™ is the one program every amateur or shortwave listener needs. See your Kenwood dealer for system requirements and more information.

KENWOOD

...pacesetter in Amateur Radio

KENWOOD U.S.A. CORPORATION COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street, Long Beach, CA 90801-5745

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QRX . . .

EDITED BY LINDA RENEAU KA1UKM

The Next SAREX Mission

Four ham astronauts will fly in the upcoming STS-45 shuttle mission. Pilot Brian Duffy N5WQW, mission specialist Kathy Sullivan (call pending), mission specialist Dave Leestma N5WQC and payload specialist Dirk Frimout ON1AFD plan to operate on 2m FM during the eight-day flight.

Currently scheduled for liftoff on March 14 at 1313 UTC (an alternate date of March 22 at 1301 UTC is possible), this mission will fly in a high inclination orbit (57°) which should provide radio coverage over a good deal of the Earth. The seven crew members will be divided into two teams on different sleep schedules which will result in 24-hour activity. Since there are ham astronauts on both teams, there will be plenty of opportunity for two-way contacts.

A number of pre-arranged school contacts will be established as part of the mission profile. In addition, there is a good chance that quite a few free-for-all contacts will be made, particularly during each team's pre- and post-sleep times. Since system power is limited during this flight, the shuttle's 2m Motorola HT will be powered by battery packs (a total of 12 will be carried along). All contacts will be on 2m FM voice. There is a good chance you will hear the shuttle transmissions on 145.55 MHz during most passes in your range. Transmit up to the shuttle on one of the following frequenices: 144.91, 144.95 and 144.97 MHz. *TNX to Lou McFadin W5DID at NASA JSC.*

Kenwood K.I.D.S.

Kenwood has come up with an exciting program called Kenwood K.I.D.S. to help young people discover the fun of amateur radio. Kenwood asks amateur radio clubs to co-sponsor a local school, scout troop, or youth group with the Kenwood K.I.D.S. program.

Sponsoring clubs provide elmering while Kenwood provides the educational materials and prizes. For every 10 new hams sponsored, a club receives 10 $25 gift certificates from Kenwood.

All clubs sponsoring at least one group of 10 Kenwood Kids by March 1, 1992, will be entered in a drawing for Kenwood's TS-950SD top of the line transceiver. Each of the youth clubs with 10 or more new members will have a chance to win one of 10 complete stations consisting of a TS-140S transceiver, PS-430 power supply, AT-250 antenna tuner, and MC-60A microphone.

Write Kenwood for a Kenwood K.I.D.S. package containing 10 copies of *Now You're Talking,* the instructor's manual, a certificate for one copy of Ham Windows, and the Kenwood K.I.D.S.'s program outline and promotional materials, including forms to claim gift certificates. Kenwood U.S.A. Corporation, Kenwood K.I.D.S. Program, P.O. Box 22745, Long Beach CA 90801-5745. *TNX Mike Forsythe of Kenwood.*

DARA Scholarships

Eight scholarships in the amount of $2,000 each will be awarded this year by the Dayton Scholarship Program to deserving students graduating from high school. The awards will be based on financial need, scholastic achievement, and involvement with the amateur radio community. There are no restrictions on the course of study, nor must the student be planning on a four-year baccalaureate degree. However, schools or technical institutes awarding associate degrees must be accredited.

Three forms must be submitted no later than May 15, 1992: one by the student, one by the student's principal or guidance counselor, and one by a licensed member of the local radio club. If there is no local club, any licensed amateur radio operator may fill out the form.

The student's application must be submitted with: 1. A copy of the student's amateur radio license; 2. A transcript of the student's high school grades; 3. A copy of the letter of acceptance from the school the student will be attending; 4. A 75-word or less typed composition explaining the student's future plans, and why the scholarship is important. The student should be specific about how the scholarship will directly affect the applicant and the applicant's family.

Winners will be notified by telephone around June 1, 1992. For application forms, write DARA Scholarship Committee, 45 Cinnamon Court, Springboro OH 45066.

New ARRL Director Elected

George S. Wilson W4OYI, an attorney from Owensboro, Kentucky, was elected President of the Board of Directors of the ARRL on January 17.

Mr. Wilson succeeds Dr. Larry E. Price W4RA, of Statesboro, Georgia, who has been President of the League since 1984. Dr. Price will continue to serve as International Vice President of the League.

Mr. Wilson, who has been an active ham since the age of 16, was first elected Vice Director to the ARRL Board from the Great Lakes Division in 1982. He has served on numerous board committees, and has long been involved in the League's emergency and public service communications activities. In addition, he served as an advisor on disaster communication to the Kentucky State government.

New Source of 70cm QRM

National Oceanic and Atmospheric Administration stations are being required to relocate their wind profiler radars from 404.370 MHz to 449.000 MHz. Although most RF is directed vertically within 17 degrees, the main carrier's high mode will be approaching an ERP of 22 megawatts, and the 30 to 60 dB of residual RF may not be enough to preclude interference to those within 5 MHz of operation. UHF FM repeater operations in the area of NOAA stations are likely to experience some degradation.

This frequency move is being directed by the National Telecommunications and Information Administration (NTIA) and Interdepartmental Radio Advisory Committee (IRAC). The move is based on concerns about the rare instances of interference to the safety-of-life SARSAT/COSPAS satellite uplink systems on 406–408 MHz. Although NOAA systems inhibit operation during an overhead pass, other entities, such as universities, may not be as diligent.

Whit Brown WB0CJX writes: "Surely, there must be a better alternative to this move, which has been kept unusually quiet. It would seem that a minimal move downward in frequency could eliminate the infrequent satellite problem and cost the taxpayers a lot less than a banzai migration of 45 MHz, altering the operational characteristics of thousands of existing amateur repeaters and perhaps compromising the performance of other commercial services." NTIA's concern for safety-of-life issues is, of course, valid; but so are the safety-of-life services provided by the amateurs now sharing this spectrum, and public safety services from 453–454 MHz. Other services within the 10 MHz envelope include fire, broadcast auxiliary, industrial, land transportation, relay press, taxi, petroleum products, local governments, power and water, and mobile telephone. *TNX Whit Brown WB0CJX, Mid-America Coordination Council, Inc.*

TNX...

. . . to all our contributors! You can reach us by phone at (603) 525-4201, or by mail at *73 Magazine,* Forest Rd., Hancock NH 03449. Or get in touch with us on CompuServe ppn 70310,775; MCI Mail "WGEPUB"; or the 73 BBS at (603) 525–4438 (300–2400 bps), 8 data bits, no parity, one stop bit. News items that don't make it into *73* are often put in our other monthly publication, *Radio Fun.* You can also send news items by FAX at (603) 525–4423.

Build a GaAsFET Preamp Sequencer

Mast-mount your preamp for maximum performance.

by Ron Klimas WZ1V (ex-WA1VRH)

Thinking about mast-mounting a receiver preamp for your VHF/UHF station? Build this digital sequencer for uncurtailed SSB or semi-break-in CW operating!

If your VHF/UHF station has a few dB of feedline loss, and you use a transceiver, mast-mounting a GaAsFET preamp offers significant receive improvement. You can mount the preamp in-line with the main feedline using a pair of SPDT coaxial relays for isolation during transmit. The big problem is to keep that transmitter RF out of your preamp. Avoiding the pitfalls of a blown device will require adequate relay isolation, transient suppression, and timing control of your transceiver, linear amplifier, and relays.

Circuit Information

The sequencer circuit is shown in Figure 1. A 7805 on-board regulator allows operation from a single 12-volt supply, and provides RFI immunity. Key elements of the sequencer are an RS flip-flop, U2 pins 8–13, used to guarantee continuity of preamp bypass at the beginning of a transmit sequence; and a nominal 110 millisecond delay generated by integrator (R1 + R2) * C1 feeding into Schmitt-trigger U4. This gate has a volt of hysteresis with a positive threshold of 2.8V, and a negative threshold of 1.8V. This guarantees that the output cannot change state until C1's charge changes by at least a volt, thus ensuring a fixed minimum delay under worst-case input conditions. More on this subject later. Bypass switch S1 is provided to manually disengage the preamp. Mode switch S2 routes the keying to either PTT or CW input.

When a ground closure from either the mike PTT or CW key is applied, U3 pin 6 goes high. This sets the RS flip-flop Q output at U2 pin 10 and disengages the preamp. C1 charges toward the positive threshold of Schmitt-trigger gate U4 pin 1.

After a 110 ms delay from (R2 + R1) * C1, U4 pins 4 and 10 go high. This enables AND gate U1 to key the transmitter. The preamp is held disengaged via U2 pin 3 high, and the flip-flop is reset for the next cycle.

Most transceivers go into a non-defeatable

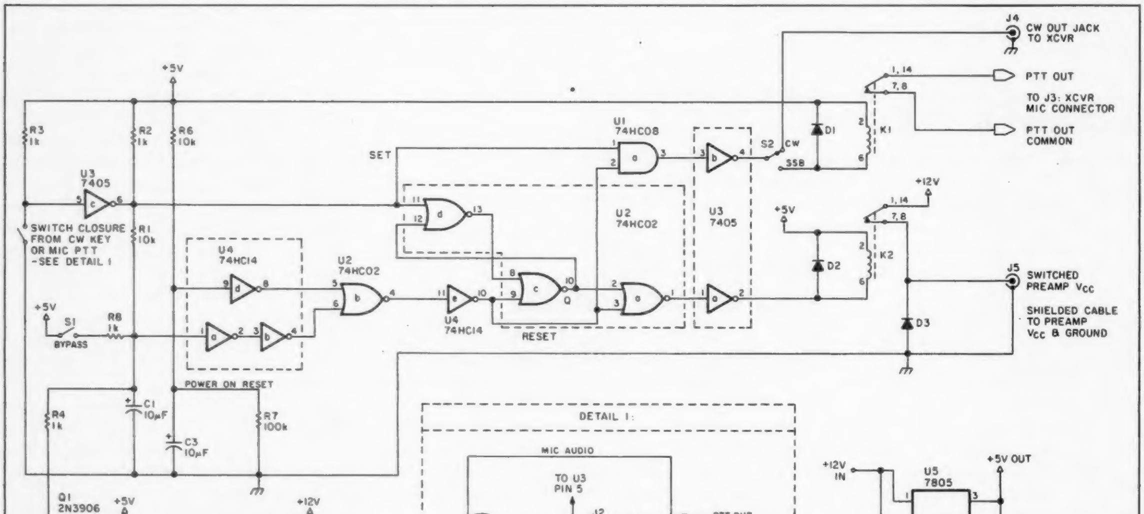

+5V
R3 1k
R2 1k
R6 10k
U3 7405
SET
SWITCH CLOSURE FROM CW KEY OR MIC PTT -SEE DETAIL 1
R1 10k
U4 74HC14
U2 74HC02
+5V
S1
BYPASS
R8 1k
U4 74HC14
RESET
Q
POWER ON RESET
R4 1k
C1 10µF
C3 10µF
R7 100k
Q1 2N3906
+5V
+12V
R5 10k
J6 AUX
D4
COIL OF ACCESSORY RELAY FOR LINEAR AMP
XCVR AUX CONTACTS
C2 0.22µF
U1 74HC08
U2 74HC02
U3 7405
S2
CW
SSB
D1
K1
1, 14
7, 8
J4
CW OUT JACK TO XCVR
PTT OUT
TO J3: XCVR MIC CONNECTOR
PTT OUT COMMON
+12V
+5V
D2
K2
J5
SWITCHED PREAMP Vcc
SHIELDED CABLE TO PREAMP Vcc & GROUND
D3
DETAIL 1:
MIC AUDIO
TO U3 PIN 5
MIC PTT
PTT COMMON
J2
CW KEY INPUT
PTT OUT
FROM K1
PTT OUT COMMON
MIC AUDIO COMMON
J1 MIC IN CONNECTOR
J3 XCVR MIC CONNECTOR
+12V IN
GROUND IN
U5 7805
+5V OUT
C4 10µF
C5 10µF

Figure 1. Schematic for the GaAsFET preamp sequencer.

BEST OF MFJ

MFJ, Bencher and Curtis team up to bring you America's most popular keyer in a compact package for smooth easy CW

MFJ-422B **$134.95**

The best of all CW world's -- a deluxe MFJ Keyer using a Curtis 8044ABM chip in a compact package that fits right on the Bencher iambic paddle!

This MFJ Keyer is small in size but big in features. **You** get iambic keying, adjustable weight and tone and front panel volume and speed controls (8-50 WPM), dot-dash memories, speaker, sidetone and push button selection of automatic or semi-automatic/ tune modes. It's also totally RF proof and has ultra-reliable solid state outputs that key both tube and solid state rigs. Use 9 volt battery or 110 VAC with MFJ-1305, $12.95.

The keyer mounts on a Bencher paddle to form a small (4-1/8 x 2-5/8 x 5½ inches) attractive combination that is a pleasure to look at and use.

The Bencher paddle has adjustable gold plated silver contacts, lucite paddles, chrome plated brass and a heavy steel base with non-skid feet.

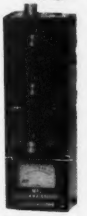
You can buy just the keyer assembly, MFJ-422BX, for only $79.95 to mount on **your** Bencher paddle.

Deluxe 300 W Tuner

MFJ-949D **$149.95** **MFJ-949D** is the world's most popular 300 watt PEP tuner. It covers 1.8-30 MHz, gives you a new peak and average reading Cross-Needle SWR/Wattmeter, built-in dummy load, 6 position antenna switch and 4:1 balun -- in a compact 10 x 3 x 7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Antenna Bridge

MFJ-204B **$79.95**



Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge.

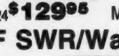
No other equipment needed -- take it to your antenna site. Determine if your antenna is too long or too short, measure its resonate frequency and antenna resistance to 500 ohms. It's the easiest, most convenient way to determine antenna performance. Built-in resistance bridge, null meter, tunable oscillator-driver (1.8-30 MHz). Use 9 V battery or 110 VAC with AC adapter, $12.95.

Super Active Antenna

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy-to-operate active antenna ... quiet ... excellent dynamic range ... good gain ... very low noise ... broad frequency coverage ... excellent choice."

Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz to 30 MHz.

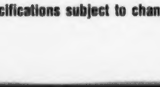
Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Switch two receivers and aux. or active antenna. 6x3x5 in. Remote unit has 54 inch whip, 50 ft. coax and connector. 3x2x4 in. Use 12 VDC or 110 VAC with MFJ-1312, $12.95.



MFJ-1024 **$129.95**

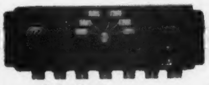
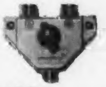
VHF SWR/Wattmeter

MFJ-812B **$29.95**



Covers 2 Meters and 220 MHz. 30 or 300 Watt scales. Also reads relative field strength 1-170 MHz and SWR above 14 MHz. 4½x2¼x3 in.

MFJ Coax Antenna Switches

$34.95 MFJ-1701 **$21.95** MFJ-1702B **$59.95** MFJ-1704

Select any of several antennas from your operating desk with these MFJ Coax Switches. They feature mounting holes and automatic grounding of unused terminals. They come with MFJ's one year **unconditional** guarantee.

MFJ-1701, $34.95. 6 pos. 2 KW PEP, 1 KW CW. 1.8-30 MHz. 10x3x1½ in.

MFJ-1702B, $21.95. 2 positions plus new Center Ground. 2.5 KW PEP, 1 KW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 ohm. 3x2x2 in.

MFJ-1704, $59.95. 4 position cavity switch with lightening/surge protection device. Center ground. 2.5 KW PEP, 1 KW CW. Low SWR. Isolation better than 50 dB at 500 MHz. Negligible loss. 50 ohm. 6¼x4¼x1¼ in.

"Dry" Dummy Loads for HF/VHF/UHF

MFJ-260B **$28.95** MFJ-264 **$59.95** MFJ-264N **$69.95**

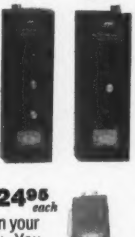
MFJ has a full line of dummy loads to suit your needs. Use a dummy load for tuning to reduce needless (and illegal) QRM and save your finals.

MFJ-260B, $28.95. VHF/HF. Air cooled, non-inductive 50 ohm resistor. SO-239 connector. Handles 300 Watts. Run full load for 30 seconds, derating curve to 5 minutes. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 150 MHz. 2½x2½x7 in.

MFJ-264, $59.95. Versatile UHF/VHF/HF 1.5 KW load. Low SWR to 650 MHz. Run 100 watts for 10 minutes, 1500 watts for 10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 inches. **MFJ-264N: "N" connector.**

HF or VHF SWR Analyzer™

MFJ-207 **$99.95** MFJ-208 **$89.95**



MFJ's revolutionary new SWR Analyzers give you a complete picture of your antenna SWR over an entire band -- without a transmitter, SWR meter or **any** other equipment. Just plug your antenna into the coax connector, set your SWR Analyzer™ to the frequency and read SWR off the meter. You can find your antennas true resonant frequency right at your feedline -- something a noise bridge can't do. Battery operated and handheld sized -- makes it **soooo easy** to work on antennas. MFJ-207, 1.8-30 MHz; MFJ-208, 142-156 MHz. 9V battery or 110 'VAC with MFJ-1312, $12.95.

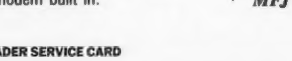
MFJ Speaker Mics

MFJ-283, 284, 285, 285L, 286, 287 or 287L **$24.95** *each*

MFJ's compact Speaker/Mics let you carry your HT on your belt and never have to remove it to monitor calls or talk. You get a wide range speaker and first-rate electret mic element for superb audio on transmit and receive. Earphone jack, lapel clip, PTT. MFJ-284 fits ICOM, Yaesu, Alinco. MFJ-286 fits Kenwood. **MINIATURE SPEAKER MICS:** 2" x 1¼" x ¼". MFJ-285 and MFJ-285L (with "L" connector) fit Icom, Yaesu or Alinco; MFJ-287 or MFJ-287L fit Kenwood; MFJ-283: Split jack Alinco. All features of compact models. One year guarantee.

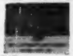
MFJ-1278 Multi-Mode Data Controller

MFJ-1278 **$279.95**



Use computer to transmit/ receive in **all 9** digital modes: Packet, AMTOR, ASCII, CW, RTTY, FAX, SSTV, Contest Memory Keyer and Navtex receive. Automatic Signal Analysis™ (ASA™), Easy-Mail™, printer port, 20 LED tuning indicator, AC supply, Host, Multi-gray level modem, CW key paddle jack and tons more. Options include 2400 baud modem (MFJ-2400, $69.95) and software with cables for IBM compatible, Commodore 64/128, Macintosh and VIC-20. **MFJ-1278T, $359.95.** MFJ-1278 with 2400 modem built in.

12/24 Hour LCD Clocks



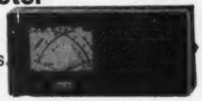
$19.95 MFJ-108B **$9.95** MFJ-107B

Huge 5/8 inch bold LCD digits let you see the time from anywhere in your shack. Choose from the dual clock that has separate UTC/local time display or the single 24 hour ham clock.

Mounted in a brushed aluminum frame. Easy to set. The world's most popular ham clocks for accurate logs. MFJ-108B 4½x1x2; MFJ-107B 2¼x1x2 in.

Cross-Needle SWR Meter

MFJ-815B **$69.95**



MFJ Cross-Needle SWR/ Wattmeter has a new **peak** reading function! It shows you SWR, forward and reflected power in 2000/500 and 200/50 watt ranges. Covers 1.8-30 MHz.

Mechanical zero adjusts for movement. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Deluxe Code Practice Oscillator

MFJ-557 **$24.95**

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable because it runs on a 9-volt battery (not included) or an AC adapter ($12.95) that plugs into a jack on the side.

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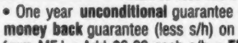

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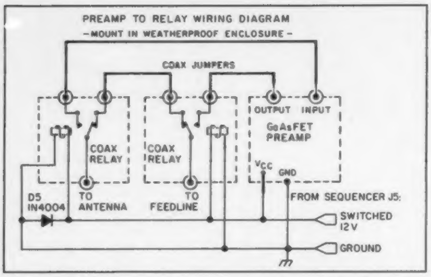
PREAMP TO RELAY WIRING DIAGRAM
-MOUNT IN WEATHERPROOF ENCLOSURE-
COAX JUMPERS
OUTPUT
INPUT
GaAsFET PREAMP
COAX RELAY
COAX RELAY
VCC
GND
D5 IN4004
TO ANTENNA
TO FEEDLINE
FROM SEQUENCER J5:
SWITCHED 12V
GROUND

Figure 2. Mast-mounted preamp-to-relay wiring diagram.

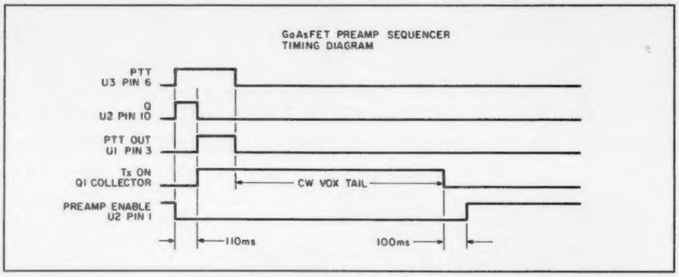
GaAsFET PREAMP SEQUENCER
TIMING DIAGRAM
PTT U3 PIN 6
Q U2 PIN 10
PTT OUT U1 PIN 3
Tx ON Q1 COLLECTOR
CW VOX TAIL
PREAMP ENABLE U2 PIN 1
110ms
100ms

Figure 3. Sequencer timing diagram.

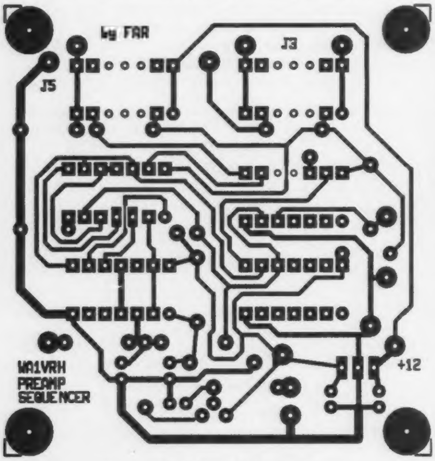
by FAR
J3
J5
WA1VRH
PREAMP
SEQUENCER
+12

Figure 4. PC board foil pattern.

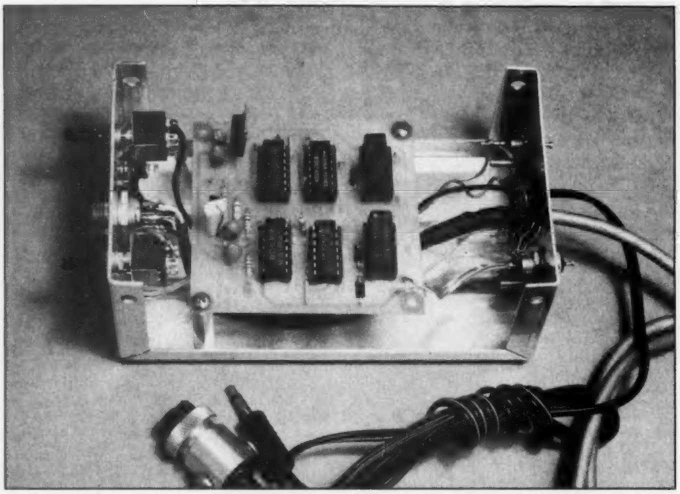

Photo. Inside view of the completed preamp sequencer.

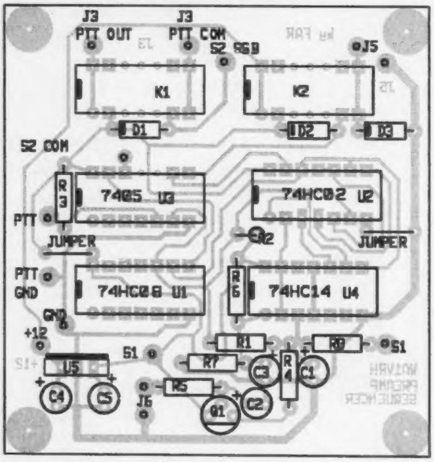
J3
PTT OUT
J3
PTT COM
S2 SGB
J5
K1
K2
D1
D2
D3
S2 COM
R3
7405 U3
74HC02 U2
PTT
JUMPER
Q2
JUMPER
PTT GND
74HC08 U1
R6
74HC14 U4
GND
+12
S1
R1
R8
S1
U5
R7
C3
R4
C1
R5
C4
C5
J6
Q1
C2

Figure 5. PC board parts placement.

GaAsFET Preamp Sequencer

Part	Description
U1	74HC08 AND IC
U2	74HC02 NOR IC
U3	7405 open collector inverter IC
U4	74HC14 Schmitt inverter IC
U5	7805 +5VDC regulator
Q1	2N3906 PNP transistor
C1,3,4,5	10 µF, 25V tantalum, 20% or better
C2	0.22 µF, 25V tantalum, 20% or better
R2,3,4,8	1.0k, 0.25W, 5%
R1,5,6	10k, 0.25W, 5%
R7	100k, 0.25W, 5%
D1,2,3,4,5	1N4004 rectifier or equivalent
J1,3	mike chassis connector
J2,4,5,6	mini-phone jack open circuit
K1,2	5V coil SPST DIP relay Mouser P/N 433-D31A310 or equivalent
S1,2	SPDT mini toggle switch
CC1,2	16-pin component carrier adapter plug

All parts are available through Mouser Electronics, P.O. 699, Mansfield TX 76063; (800) 346-6873. A blank PC board is available for $4 + $1.50 shipping per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

VOX mode during CW semi-break-in operation. This is a fast attack, slow decay VOX that holds the transmit mode on between CW characters while you send, preventing relay chatter. Unfortunately, residual RF is usually present at the output during this apparently idle mode. A linear amplifier would most surely bring this up to a level that could be potentially damaging to a preamp engaged in the line. The decay time of this "VOX tail" also varies from rig to rig. Therefore, the sequencer must be able to sense this condition and keep the preamp disengaged. This is done by interfacing the transceiver's AUX contacts, used to hard-key a linear amp, into the sequencer via Q1. The fixed minimum worst case time for the Schmitt trigger to change state is 44 ms. This is derived from the following capacitance discharge equation:

$$V_{C1} = E_{MAX} \bullet e^{-t/RC}$$
$$1.8 = 2.8 \bullet e^{-t/10k} \bullet 10\ \mu F$$
$$0.643 = e^{-t/100ms}$$
$$\ln(0.643) = -0.442$$
$$0.442 = t/100ms$$
$$t = 44.2\ ms$$

The time constant (R5 × C2) for Q1 to conduct after the AUX contacts close is only 2.2 ms, however. Therefore, Q1 will recharge C1 long before a state change could occur. The integrator R1 × C1 is forced to guarantee a full discharge cycle of 100 ms, maintaining absolute protection of your preamp at all times. None of the commercial or published designs I've seen yet will guarantee this level of timing integrity on both the make and break sides of the cycle under every type of input condition. A popular design, using comparators with inadequate hysteresis

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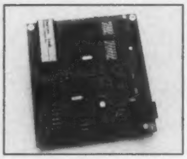

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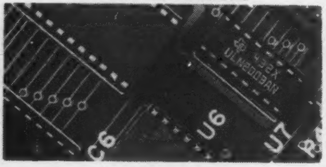

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and no latching/feedback techniques, may work fine on SSB, but invites disaster on CW. Figure 3, the timing diagram, summarizes this system's operation.

A power-on-reset is provided to reset the flip-flop to a known state on power-up. 1N4004 diodes are placed across all relay coils for transient suppression.

Construction

If you don't want to use the PC board patterns, you can construct the circuit on a 0.100-inch grid phenolic prototype board using wire-wrap sockets and component carrier adapter plugs for passive components. Use short connections between C4, C5, and U5, however. The 1N4004 diodes connections across each relay coil should also be kept short. (Don't forget to solder one across your accessory relay coil).

> ***"It is advisable to test your circuit before wiring in your preamp head/coax relays."***

If you have two or more items to key on transmit (such as a transverter and a linear amplifier), you will need an accessory relay with as many pairs of contacts as you have items. If you use your AUX contacts to directly key your only accessory, install a 2.2k resistor between the J6 tip and +12V. If your transceiver outputs a positive voltage on transmit, feed it through a 2.2k resistor into the base of an NPN power transistor to switch your 12V accessory relay, wiring it's collector and grounded emitter to J6. The relay coil connects between +12V and the collector.

The chassis-mounted mike connectors are mounted on the aluminum box enclosure, and are wired to bypass all signals except PTT and CW in/out.

You will need to make up jumper cables to mate with your transceiver's connectors. Be especially certain of the integrity of the connection from your AUX contacts and J6, since this provides closed-loop feedback to the sequencer. Another consideration is the connection between the sequencer and preamp/relays. I have tried in the past to use the main feedline shield as power ground to the preamp, with a single wire for switched Vcc. I can tell you from experience what happens if you forget to turn off your GaAsFET while unscrewing the feedline connector from your equipment. The inductive kickback, having no path to bleed off, blew a device. The diodes absorb the transient only while ground is connected. Use an unspliced length of RG-58/59, or some kind of shielded cable, for DC power to save yourself this experience!

Circuit Check-Out

It is advisable to test your circuit before wiring in your preamp head/coax relays. Connect your microphone and CW key to the sequencer. Make no connections to your transceiver yet. Obtain three LEDs and a 47 μF capacitor. Observing polarity, clip lead the 47 μF capacitor in parallel with C1. Solder 1k resistors in series with each LED. Observing polarity, clip lead the LED indicators across J5 switched Vcc and ground, J3 PTT out and +12V, and between J4 tip and +12V. Clip lead the J3 PTT out common point to ground. Apply 12 volts. The "preamp" LED across J5 should be the only one on. Place S2 in SSB position. As you key the mike PTT, you should just be able to perceive the "preamp" LED across J5 extinguish before the "PTT" LED across J3 comes on. When you unkey the mike, the LED across J3 should extinguish just before the LED across J5 re-lights.

Place S2 in the CW position and look for the same results, but at the "CW out" LED across J4. Check to see that you can briefly light the J4 LED with a "dah" from your key. Finally, short J6 tip to ground with a clip lead. The LED on J5 should remain off as long as this short is connected. This completes the checkout.

Operation

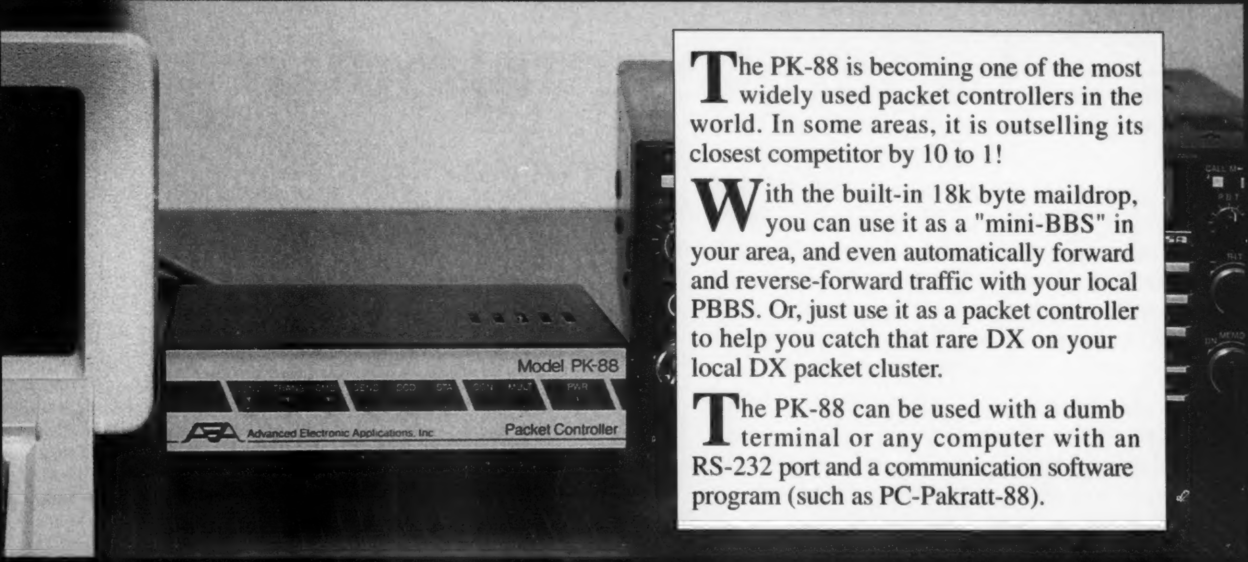
With everything in place, and S1 to preamp on position, S2 to SSB, when power is applied the preamp should be on. When you PTT the mike, you will just notice the receiver quiet before TX comes on. When you unkey, TX should go off before the preamp comes on. Set S2 to CW. Attempt to send a dah. The first dah will be abbreviated to a dit sound on your rig's sidetone if you use a keyer 13–20 wpm. This is normal, a result of the 110 ms delay. You will have to get accustomed to sending out an "extra" abbreviated dah at the start of each CW transmission. Alternatively, you can also flip S1 to bypass, start transmitting, and flip S1 back in the middle of your transmission. This manual bypass switch is wired so that the end of cycle delay is always present to protect your device.

Closing Comments

I have used this design at my station with a 2 meter multimode rig and a kilowatt amplifier for years with great success. If you are tempted to decrease the delay time, be aware that the average relay takes between 5 and 10 ms to close, but about twice as long to release as a result of the coil diode re-circulating current back into the collapsing field. The contacts are likely to have bounce for several more ms. Other things to consider are the switching times of your transceiver and accessory relays. Should you have a scope to measure and add these times up, plus a reasonable safety margin, and come up with less than 100 ms, you could then decrease C1 by a corresponding amount. I would not recommend it otherwise. 73

You may contact Ronald Klimas WZ1V at 458 Allentown Rd., Bristol CT 06010.

Now you see it....



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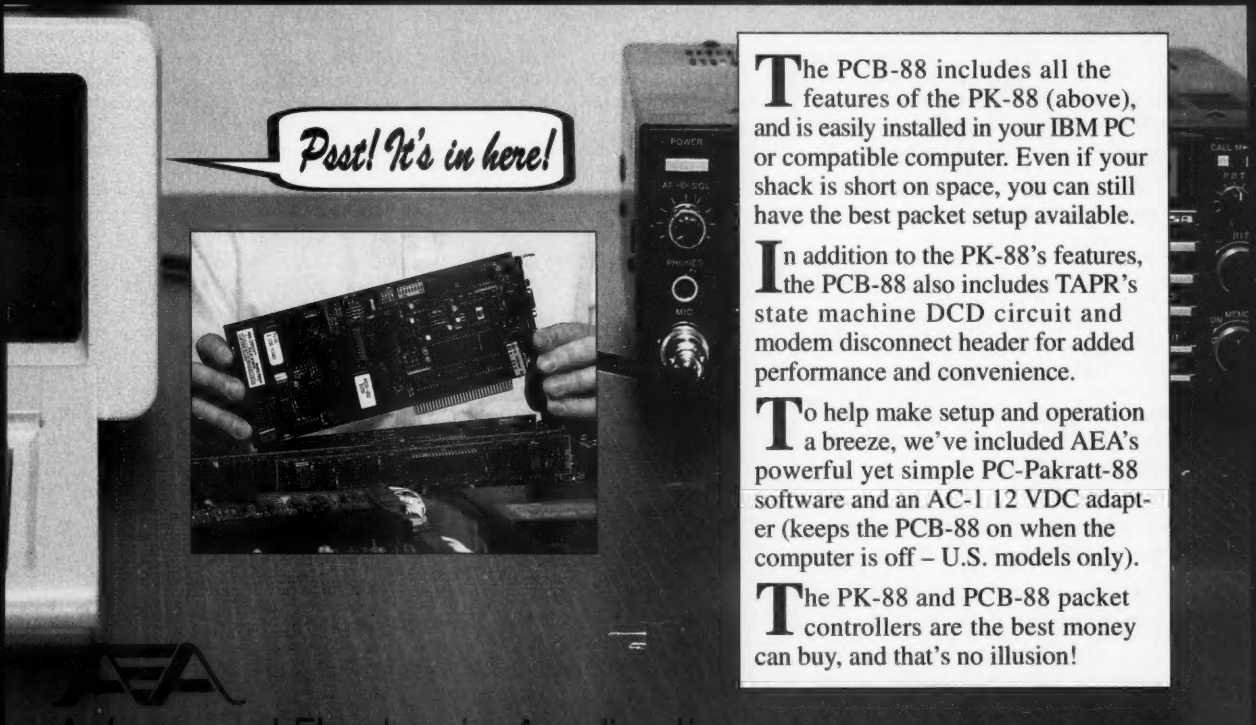

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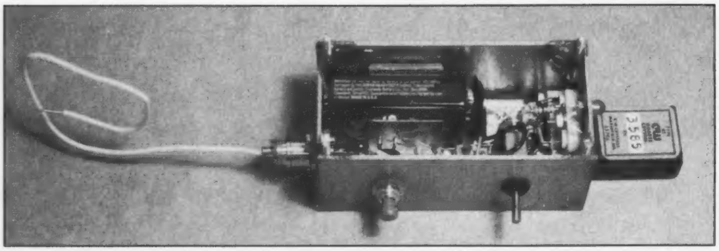

Photo A. This pulsed crystal signal source can help you find the right frequency in a crowded ham band. The author's prototype was built using the "ugly construction" technique, however a PC board pattern is available (see Figures 2 and 3).

First, a confession. I'd rather build than operate. Once I finish a project, I'll use it on the air for a few days, then I'll start on the next project.

I build and operate a lot of very simple rigs. My receivers are usually direct conversion (or regenerative!), and I sometimes have a hard time just finding the ham bands, let alone staying inside them. When I'm using a crystal controlled transmitter this isn't a problem, but I sometimes use simple VFO controlled rigs (like a Heath HW-7 or a home-brew transceiver) with inadequate dial calibration. With these transceivers, it's nice to have a crystal controlled spotting oscillator, like the one in Photo A. I just pop a crystal into the "chirper" and dial my receiver until I find the beeping signal source. Then I know I'm right where I want to be.

You can use this pulsed crystal oscillator to find the right frequency on a simple receiver, stay inside the band with an uncalibrated VFO transceiver, or to peak RF filters.

The "chirping" of this oscillator makes it easy to find in my receiver, even on a crowded ham band full of heterodynes. It also has a continuous-on mode so it can be used as a weak-signal source for peaking receiver preselectors and RF filters.

Circuit Description

See the schematic for the crystal chirper. The circuit couldn't be much simpler; its heart is a JFET crystal oscillator. Transistor Q1 switches the power supply to the oscillator. When Q1 is on, the oscillator runs. Crystal Y1 sets the oscillator frequency; this can be just about any crystal from 1 MHz up through 30 MHz.

Switch S1 provides a high at the base of Q1, switching it on and causing the oscillator to run continuously. I use this mode when I'm optimizing filters. Switch S2 (a momentary pushbutton) applies power to U1, a 555 timer IC connected as an astable multivibrator. The 555 runs at about five pulses per second, switching Q1 (and the crystal oscillator) on and off five times per second. I use the pulse mode when I use the oscillator as a spotter with my simple QRP rigs. It can be hard to stay in band with an uncalibrated transceiver, but once I spot the beeping oscillator, I know I can tune a bit to one side or the other and still be legal.

Because the RF oscillator does not run unless Q1 is switched on, and the 555 does not run unless power is applied through S2, the chirper draws no current when it is not in use. An ON/OFF switch is unnecessary, and a single 9-volt battery lasts a long time

Construction

Almost any construction technique will work with the chirper. I prefer "ugly construction," with all the components mounted up on one side of a scrap of PC board (as shown in Photo A). You could also use a Radio Shack prototyping board, or use the printed circuit board layouts in Figure 2 and 3.

I built the prototype inside a printed-circuit board enclosure, but shielding is not critical. In fact, you don't really want to shield this project! It's a signal source, after all, and you want the signal to get out and into your receiver. I built an earlier version inside a glass jar, and it worked great, even without the wire "antenna" shown on the prototype in Photo A.

I used crystal sockets for both FT243 and HC6 crystals in my prototype. I've had very good luck with crystals from CW Crystals, in Marshfield, Missouri. If you use these crystals, you'll only need an FT243 socket. You can also use alligator clips as a "socket" if you keep the leads short.

Parts Substitution

The parts shown in the schematic are simply the parts I used in my prototype. A wide range of parts values and types can be substituted for them. Q1 can be a 2N3904, 2N2222, or 2N4401 (or just about any other "generic" NPN transistor). Q2 can be a 2N5484 or 2N4416 instead of the MPF102 shown. U1 can be a plain-vanilla 555 (it may have numbers like NE555 or LM555, but it's the same part either way), or you can use the CMOS 7555 for even lower power consumption. At the low duty cycle of the chirper, you don't really need the more expensive CMOS part.

Any small-signal diodes will work as replacements for the 1N914s. 1N4148s are a good choice, and again, the generic Radio Shack parts will work here. The bypass capacitors (the 0.01 µF caps connected from the emitter of Q1 and the junction of the two

Continued on page 30

Parts List

Q1	2N3904 transistor
Q2	MPF102 FET
U1	NE555 timer IC
R1	1k resistor
R2	3.3k
R3,R5,R6	10k
R4	100k
C1,C2	0.01 µF capacitor
C3	10 µF electrolytic
C4,C5	100 pF
SW1	SPST switch
SW2	momentary contact switch (normally open)
RFC1	10 µH RF choke
XTAL	see text
D1,D2	1N914 diode
LED1	red LED

A blank PC board is available for $4 + $1.50 shipping per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

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IC-2410A 25w 2m/440 FM/TTP mic	$889.00	749^{95}
IC-2410H 45w 2m/35w 440 FM/TTP mic	932.00	789^{95}
IC-3220A 25w 2m/440 FM/TTP mic	685.00	579^{95}
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IC-2500A 35w 440/10w 1.2GHz FM	1039.00	869^{95}

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UX-R91A Broad band receiver unit	405.00	359^{95}
UX-19A 10w 10m unit.........................	311.00	279^{95}
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IC-W2A 2m/440 HT.............	627.00	529^{95}

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EX-257 FM unit..................................	49.00	
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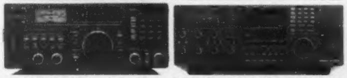

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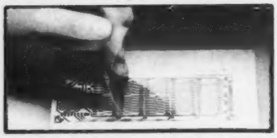

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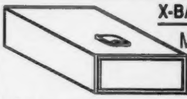

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73 Review

by Thomas S. Rowinski KA1MDA

DigiMax D-1200 Frequency Counter

Great performance at a budget price.

DigiMax Instruments Corp.
8560 Production Ave.
San Diego CA 92121
Tel. (619) 578-7171.
Price Class: $300.

My test bench, assembled entirely from hamfest finds, consists mostly of older test equipment, which is both plentiful and relatively cheap. This type of equipment is still capable of very good performance, if you don't mind the bulk.

The recent acquisition of a non-functional 440 MHz HT, however, brought out one major weakness of my system: the inability to make precise frequency measurements above 250 MHz. I had one of those inexpensive "do everything" 600 MHz counters, but the accuracy was very poor and the drift was terrible! And my rock-steady lab-grade H-P counter was only good to 25 MHz! Adding an external prescaler could expand that range to 250 MHz, but with reduced sensitivity. It was time for a new counter!

An ad in *73 Amateur Radio Today* caught my eye. Although I had never heard of DigiMax Instruments before, they appeared to offer a variety of counters featuring excellent specifications at very reasonable prices. The art of specsmanship being what it is, I decided to take a chance on the DigiMax D-1200 and wring it out on the bench!

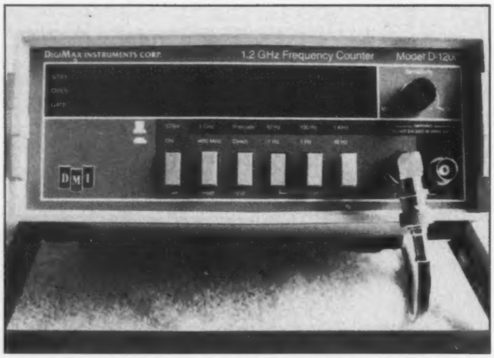

Photo A. Front panel view of the D-1200 frequency counter.

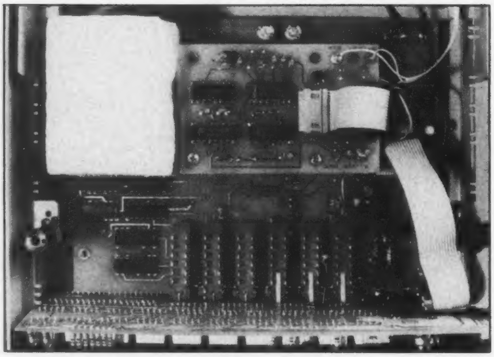

Photo B. Internal view of the D-1200 frequency counter.

The DigiMax D-1200

The DigiMax D-1200 measures approximately 3.5" H x 10" W x 9.5" D, and weighs in at just under three pounds, including the internal battery. The front panel (Photo A) includes two BNC input jacks; an input sensitivity control; an eight-and-a-half-digit LED display; LED indicators for STANDBY, OVEN, and GATE status; and a row of six push buttons for selecting time base, input, frequency range, and standby/on mode. Maximum display resolution is 0.1 Hz in direct mode, 10 Hz in prescale mode, and 0.01 Hz and 0.001 Hz using the X10 and X100 audio prescaler, respectively. The rear panel consists of a coaxial (barrel) type DC power input jack, a push-on/push-off master power switch, and a three-way toggle switch for selecting the various audio prescale modes.

The unit is housed in a light-colored textured plastic instrument case, and has a dark plastic carrying handle which also serves as a tilt bail. Power is supplied by a 12 VDC, 500 mA plug-in wall adapter/charger, or through an internal NiCd battery pack. Neither power source is supplied with the unit, although both the battery and charger/adaptor can be ordered from Digimax as options.

Finally, the D-1200 is supplied with a rather comprehensive users manual which includes not only instructions for using the frequency counter, but also block diagrams, schematics, calibration procedures, and a complete parts listing! DigiMax Instruments warranties the D-1200 for one year from date of purchase.

The Insides

The internal layout is clean and logical, and the unit appears to be well constructed (Photo B). The majority of the electronics parts are mounted on the large main PCB, which occupies most of the bottom of the enclosure. The 10 MHz proportional crystal oven is located on the main board and is housed within a rather thick styrofoam block, presumably for insulation purposes. A hole in the bottom of the case allows for easy access to a trimmer capacitor for calibration of the time base oscillator.

A smaller board mounted piggyback atop the main PCB contains the audio prescaler. The LED displays are mounted on a third printed circuit board at the front of the case, mounted at a 90 degree angle to the main board. All connections between the three PCBs are made with ribbon cable using DIP headers and sockets, making for easy disassembly and service, if ever required. A plastic battery holder for six C-sized cells is mounted inside the rear panel, complete with the charger circuitry. DigiMax offers a NiCd option for around $35, but all that is required to implement this feature is the installation of the six C-sized NiCd cells in the battery holder. If you already have these batteries at home, save the $35 and do it yourself!

Performance

The performance evaluation was conducted in two phases. First, I bench-tested the unit to verify the manufacturer's published specifications. For test equipment, I used a Hewlett-Packard 241A oscillator, 403B AC voltmeter, and 8654A RF signal generator; a Phillips PM6652C frequency counter; and a Soar 5030 digital multimeter. Due to equipment limitations, the RF tests were limited to a maximum frequency of 535 MHz. In the second phase, I used the D-1200 extensively in

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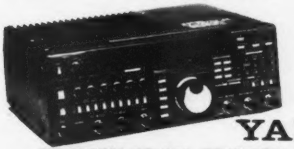

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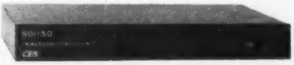

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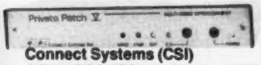

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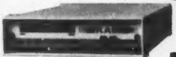

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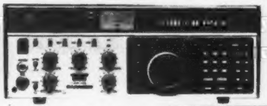

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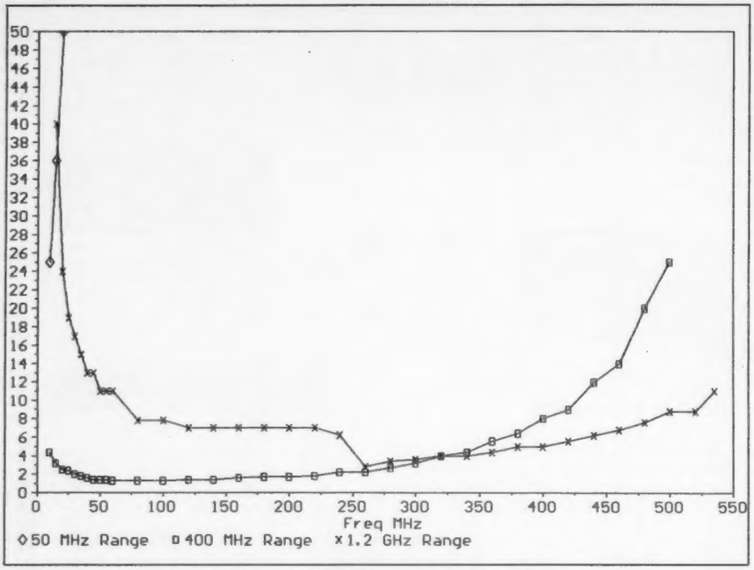

Figure 1. RF input sensitivity vs. frequency.

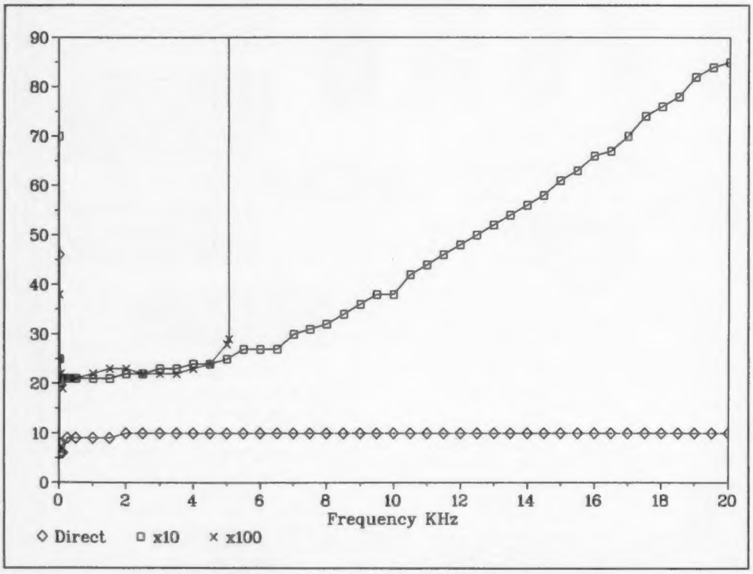

Figure 2. AF input sensitivity vs. frequency.

a number of environments, including bench-top, mobile, and field-portable operation. The purpose here was to uncover any flaws in its ergonomics, construction or materials.

Electrically, the unit performed quite well. Figure 1 shows the RF input sensitivity of the DigiMax D-1200 as a function of frequency. The direct input sensitivity, corrected to 50 ohms, ranged from 25 mV to 300 mV at 10 MHz and 55 MHz, respectively. The 400 MHz range prescaled input sensitivity registered between 4.4 mV and 25 mV at 10 and 500 MHz, respectively, with a best figure of 1.3 mV at 80 MHz. The best 1.2 GHz range prescaled input sensitivity measured was 2.8 mV at 260 MHz, with a worst case sensitivity of 40 mV occurring at 15 MHz.

AF input sensitivity was measured on the direct input only, both with and without the internal audio multiplier in line. The results are shown in Figure 2. In direct mode, sensitivity was 10 mV over the entire audio range and remained there well into the RF range. With the X10 audio multiplier switched in, best-case sensitivity of 21 mV occurred at 1 kHz, and gradually rose to 85 mV at 20 kHz. Using the X100 multiplier resulted in an input sensitivity figure of 20 to 30 mV, with a maximum frequency limit of 5 kHz.

Accuracy and drift were checked by feeding the output of a 10 MHz ovenized reference oscillator to both the D-1200 and a reference counter, and comparing the readings over a period of time. The reference counter had recently been calibrated to NIST traceable standards, and the test was conducted in an environmentally controlled room held at constant temperature and humidity. The D-1200 as received from the factory read 5 Hz low. Maximum drift after a two-hour warm-up period was no more than ±0.3 Hz over the next five hours (yes, that was 3/10 of one hertz)! The input sensitivity control had a range of approximately 37 dB on the prescale input, and had no effect on the direct input. Power consumption was 50 mA when charging the battery pack, 200 mA in "standby" mode (oven on), and 550 mA when the counter was operational. The unit will operate with a supply voltage of 9 to 14 VDC.

Operation

The DigiMax D-1200 was very easy to use. All the controls functioned as designed, and the two-tone color layout of the front panel helped avoid any confusion as to the control settings. The front panel power button switches the unit between "on" and "standby" mode. (In standby, all electronics are powered down except for the crystal oven and time base oscillator). When in standby, a front panel LED lights to alert the user of the increased battery drain. The main power switch on the rear panel switches off power to all the circuits. This is handy when prolonged battery operation is required, at the expense of some stability. The batteries are automatically trickle-charged whenever an external power source is applied to the D-1200's power jack, regardless of the main power and standby switch settings.

Manufacturer's Specifications for DigiMax D-1200 Counter

Frequency Range	10 Hz–50 MHz (Direct)	
	10 MHz–1.2 GHz (Prescale)	
Sensitivity	10–50mV typ.	50 Hz–25 MHz (Direct)
	10–50 mV typ.	25 MHz–300 MHz (Prescale)
	20–100 mV typ.	300 MHz–1 GHz (Prescale)
Resolution	0.001 Hz, 0.01 Hz (Audio Scaler)	
	0.1 Hz, 1 Hz, 10 Hz (Direct)	
	10 Hz, 100 Hz, 1 KHz (Prescale)	
Time Base	10 MHz crystal proportional oven	
Accuracy	±0.05 ppm (20–40 degrees C)	
	±1 count	
Aging	1 ppm per year, typ.	
Input Impedance	1 Megohm / 20 pF (Direct)	
	50 Ohms (Prescale)	

One area which caused some minor confusion was the crystal oven indicator. On some days, the "oven" LED would go on as soon as I switched the counter on. At other times, it took 30 to 40 minutes for the LED to come on. Fearing I had an intermittent crystal oven, I called DigiMax, and a quick chat (yes—I talked to a real, live, knowledgeable human being on the first try!) put my concerns to rest. On my older equipment, the oven indicator turns on whenever the heating elements are energized, showing the oven is operating. On the DigiMax D-1200, the oven indicator goes on when the oven has reached operating temperature! I guess I was used to the old school. The system used on the D-1200 is actually more logical, since illumination of the oven LED shows when oven temperatures have stabilized, which corresponds with best accuracy and lowest drift! Special thanks go to Mr. Dan Burton (who I later learned was the president of DigiMax!) for not only explaining the operation of the LED, but for taking the time to describe the associated circuitry and design features in detail.

Observations

The D-1200 was not, however, entirely void of problems. There were some minor flaws, mostly relating to the materials used. The front panel power/standby switch is colored red to set it apart from the other push buttons. The red color, unfortunately, is painted on the plastic, not molded in. Within three weeks, enough paint had chipped off the switch to make me want to scrape the rest off! Luckily, the poor paint adhesion made this a five-minute job using nothing more than my fingernail!

The plastic carrying handle, which doubles as a tilt bail, was a bit on the flimsy side. The handle flexed considerably, and the positioning mechanism (also made of plastic) had a sloppy and vague feel. These two minor points were the biggest flaws of the D-1200. Although neither impaired the counter's usefulness, they gave it a "cheap" feel and detracted from the otherwise excellent performance of the unit.

The D-1200 is supplied with plastic feet, but they are made of hard plastic. This, together with the relatively light weight of the counter, caused it to slip and slide excessively when placed on hard, smooth surfaces such as plastic, finished wood, or metal.

The coaxial power jack on the rear panel was an odd size. Not that it was non-standard (Radio Shack sells the mating plugs), it was just a type seldom used on other electronic equipment.

Finally, there were many times when I would have liked to stand the counter up vertically, on its rear panel. This was not possible, however, due to the shape of the case and the positioning of the main power and audio prescaler switches. Both of these switches projected beyond the rear of the instrument, making it very unstable.

Modifications

There are a few easy modifications which can be done to make the D-1200 more user friendly. First, get a set of large, square rubber self-sticking feet (available at Radio Shack) and apply them to the bottom corners of the case. This will instantly fix the slipping and sliding problem on hard surfaces!

Next, get four pieces of hard rubber, cut into 3/4" cubes. Using Super Glue™ or epoxy, glue these onto the corners of the rear panel. These blocks will serve as legs, and will make it possible to stand the counter up vertically for field use in cramped quarters.

For the more adventurous, get four switching diodes, such as the 1N914 type available at Radio Shack, and solder two diodes in parallel, front-to-back (cathode-to-anode, and anode-to-cathode). When done, you should have two sets of diodes. Now solder one pair of diodes from the center conductor of each of the BNC input jacks to ground, keeping the leads as short as possible. The diodes will conduct any time the signal level rises above 0.7 volts or so, protecting the counter input from overload. This modification should only be undertaken by those skilled in soldering delicate solid-state equipment!

Finally, I replaced the DC power input jack with a jack of the same size as the one used on my ICOM 2AT, allowing me to use one cable to power all my equipment from the mobile! This last modification is one of convenience only.

As always, before modifying any piece of gear, make sure the unit is functioning properly and out of warranty. Most manufacturers will not honor warranties on equipment which has been modified by the user. Play it safe and wait for the warranty to expire!

A Great Bargain

I have owned my unit for well over nine months now, and it has held up extremely well, even after a few minor drops (not recommended). Although test equipment limitations prevented any testing above 535 MHz, the D-1200 met and exceeded all the manufacturer's performance claims up to that frequency. Based on those results, I would accept the published specifications as valid, real-world performance data and fully expect the unit to perform as advertised all the way to its 1.2 GHz limit.

The DigiMax D-1200 frequency counter offers performance that was inaccessible to the average ham only a few years ago. To find such a level of performance in this price range is truly amazing! Although it did have a few minor faults in the area of material and finish, none of these in any way impaired its usefulness or accuracy. The clear, well-documented manual and excellent customer support were also welcome surprises!

Note that the D-1200 is strictly a frequency counter; it won't measure interval, period, or all those other functions of the fancy counters, but then it doesn't cost anywhere near as much, either! If the audio prescaler function isn't required, you can save $40 by ordering the DigiMax D-612 counter! On a scale of one to 10, I would rate the DigiMax D-1200 a solid nine, and strongly recommend it to anyone looking for a high performance frequency counter on a budget. ■

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MRF607	2.50	2SC2221	8.25	M67705L/M	42.90
MRF629	4.50	2SC2237	8.40	M67727 144LIN	109.95
MRF630	3.75	2SC2284A	24.75	M67728 440LIN	119.95
MRF641	20.50	2SC2289	15.15	M67742	109.85
MRF644	23.00	2SC2290	14.75	MHW591	42.00
MRF646	26.00	2SC2290MP	39.50	MHW592	44.75
MRF648	31.00	2SC2312C	5.40	MHW710-1,2,3	63.00
MRF660	14.00	2SC2379	31.25	MHW820-1	83.00
MRF846	44.00	2SC2509	10.85	MHW820-2	92.00

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6KD6	*ECG	19.95	5894		42.95	3CX1200D7	444.50
6LF6		19.95	6146B	*	12.95	3CX1500A7	624.50
6LQ6	*GE	19.95	3-500Z		99.95	3CX3000A7	694.50
6MJ6	Bk Cap Pr.	59.95	4CX250B		74.75	4CX250B	98.80
12BY7A	NAT	11.75	4CX350A		149.50	4CX350A	199.50
6550A	*PL	16.95	4CX1000A7		369.95	4X500A	399.95
8950	*GE	20.75	4CX1500B		465.50	3-500Z	142.95
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An ATV Downconverter with a Difference

Keep FM voice repeaters out of your picture.

by Don C. Miller W9NTP

How many times have you been working ATV on 439.25 MHz lately and an FM voice repeater wiped out the incoming ATV signal? You probably either condemned your downconverter for not having good selectivity, or you thought a few uncomplimentary things about repeaters in general. Then, on closer investigation with a tunable receiver, you found to your horror that these repeaters were in the passband of the ATV signal. Why do they do this? Don't hams respect each other's rights anymore? The truth is that the repeater is operating legally within its allocation, and the ATV station is as well. Figure 1 shows the relationship between the ATV band and the voice repeaters.

This is just one of the many problems that ATVers face today. Fortunately there is a technical solution to this problem that is both inexpensive and easy to do. Members of the Indianapolis ATVers group figured out the solution about 10 years ago. As a result, FM voice repeater interference is virtually unknown to them.

Design Background

Before discussing the solution, let's look at the way an NTSC TV set receives a commercial channel. On Channel 3, for example, the video carrier frequency is 61.25 MHz. In order to conserve spectrum, TV channels were allocated 6 MHz. Since NTSC video signals are at least 3.58 MHz wide, it wasn't possible to fit both sidebands, the color NTSC spectrum, and the sound carrier into the 6 MHz bandwidth. The diagram in Figure 2 shows the normal video and sound spectrum used to modulate a TV transmitter.

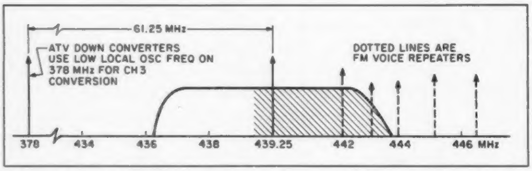

Figure 1. A typical ATV spectrum, showing FM repeaters and upper sideband detection normally used.

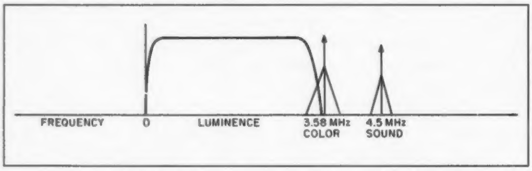

Figure 2. NTSC video spectrum with sound subcarrier.

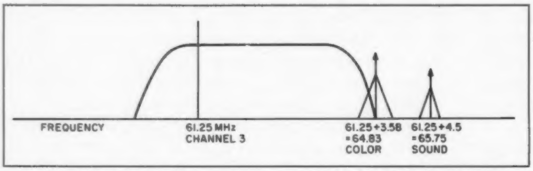

Figure 3. Typical Channel 3 vestigial sideband transmission.

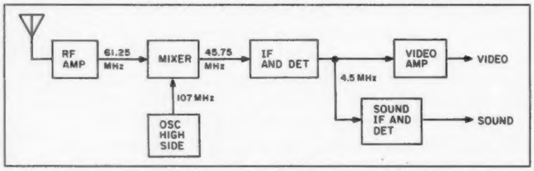

Figure 4. Block diagram of a typical TV receiver.

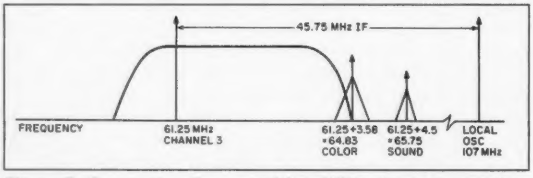

Figure 5. Conversion of upper sideband TV to lower intermediate frequency sideband by the use of a higher frequency local oscillator.

Early investigators found that if a system of vestigial sideband transmission was used, the TV signal could be transmitted with a total bandwidth not exceeding the allocated 6 MHz. The vestigial sideband system only used slightly more spectrum than a single sideband transmission system. SSB could not be used because of the need for a relatively accurate carrier insertion. They found that most of the energy of a video signal is in the first one megahertz of the bandwidth, and that if double detection of that portion of the transmitted signal was made, the total signal could be placed within the 6 MHz bandwidth.

In other words, the first one MHz of the spectrum is detected as double sideband with bandwidth attenuation, and the rest of the signal is detected as single sideband. The carrier is transmitted as part of the double sideband transmission. This spectrum is shown in Figure 3. Note that the upper sideband was chosen to be the preferred sideband, but the lower could just as well have been chosen.

All TV sets use the principle of superheterodyne, discovered in the late 1920s, which makes it possible to build just one amplifier to amplify any received frequency. Before this development, it was necessary to tune all the RF stages of a radio to every frequency that the listener desired to receive. This was partly solved by ganging all the RF stages together so that all the knobs did not have to be tuned carefully. This took a lot of the fun out of listening to the radio.

Figure 4 is a block diagram of a simple radio or TV set. The RF stage may be tuned, but tuning is not absolutely necessary. The frequen-

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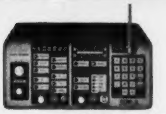
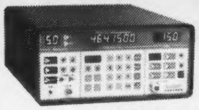


COM-3 $2795⁰⁰

2 WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantatic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features •Direct entry keyboard with programmable memory •Audio & transmitter frequency counter •LED bar graph frequency/error deviation display •0.1–10.000 µV output levels •High receive sensitivity, less than 5 µV •100 kHz to 999.9995 MHz •Continuous frequency coverage •Transmit protection, up to 100 watts •CTS tone encoder, 1 kHz and external modulation.



RSG-10 $2495⁰⁰

SYNTHESIZED SIGNAL GENERATOR

Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above • –130 to +10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

FREQUENCY COUNTERS

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CT-90 9 DIGIT 600 MHz

CT-125 9 DIGIT 1.2 GHz

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NEW CT-250 2.5 GHZ

ACCESSORIES FOR COUNTERS

Telescopic ship antenna—BNC plug, WA-10	$11.95
High impedance probe, light loading, HP-1	$16.95
Low-pass probe, audio use, LP-1	$16.95
Direct probe, general purpose use, DC-1	$16.95
Tilt bail, elevates counter for easy viewing, TB-70	$ 9.95
Rechargeable internal battery pack, BP-4	$ 9.95
CT-90 oven timebase, 0.1 ppm accuracy, OV-1	59.95

ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	<25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	<50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	<10 mV to 150 MHz <150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	<25mV to 50 MHz <15 mV to 500 MHz <100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	<25 mV to 50 MHz <10 mV to 1 GHz <50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	[illegible].95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	<50 mV	Convert your existing counter to 1.5 GHz		[illegible]

SPEED RADAR $89.95 complete kit SG-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes delivery. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.

PR-2, wired, includes AC adapter ... $59.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.

PA-1, 40W pwr amp kit	$29.95
TR-1, RF sensed T-R relay kit	$ 8.95

FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88–108 MHz FM band up to 300′ except for hi power FM-4 that goes up to ½ mile.

FM-1, basic unit	$ 5.95
FM-2, as above but with added mike preamp	$ 7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10′ away	$14.95
FM-3, complete unit includes case, battery, switch, antenna, and built-in condensor mike. Excellent fidelity, very small, kit	$16.95
FM-3WT, as above, but fully wired and tested	$19.95
SMC, miniature sensitive mike cartridge for FM-1, 2, 4	$ 2.95

MICROWAVE INTRUSION ALARM

A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.

Complete kit MD-3 . $16.95

MUSIC MACHINE

Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.

Complete kit, MM-5	$24.95
Case + knob set, CMM-5	$12.95

PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software. PC board, all necessary parts and full documentation.

Complete kit, PC-1 .... $49.95

LO NOISE PREAMPS

Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.

Each kit $17.95

TONE DECODER

A complete tone decoder on a single PC board. Features: 400–5000 Hz adjustable range via 20-turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.

Complete kit, TD-1 . $5.95

VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.

VS-1 kit. $6.95

TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!

PB-1 kit...... $14.95

NEW

SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.

SP-1 ..... $29.95 Case-CSP $12.95

TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosey know-it-alls!

TS-4 kit $9.95

LIGHT BEAM COMMUNICATORS

Transmits audio over infrared beam up to 30′—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug."

Transmitter + receiver set, LB56 .. $19.95

FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!

FR-1 kit $14.95

SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.

BN-9 kit $5.95

BROADBAND PREAMP

Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.

SA-7 kit $14.95

•2 METERS •223 MHz •440 MHz

$149⁹⁵

FANTASTIC FM TRANSCEIVERS

SYNTHESIZED—NO CRYSTALS

Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable or mobile. The The wide frequency coverage and programmable repeater splits makes the FX the perfect rig for Amateur, CAP or MARS applications. Packet ORs really appreciate the dedicated packet port, "TRUE-FM" signal and almost instant T/R switching. High speed packet? ....No problem. Twelve diode programmed channels, 5W RF output, sensitive dual conversion receiver and proven EASY assembly. Why pay more for a used foreign rig when you can have one AMERICAN MADE (by you) for less. Comes complete less case and speaker mike. Order our matching case and knob set for that pro look.

FX-146 kit (2 Meters)	$149.95
FX-223 kit (1¼ Meters)	$149.95
FX-446 kit (3/4 Meters)	$149.95
CFX matching case set	$ 24.95

2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.

PA-10 2 MTR POWER BOOSTER (10 X power gain) Fully wired & tested	$79.95
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QRP TRANSMITTERS HAM RECEIVERS

20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.

Your choice of bands (Specify band: QRP-20, 30, 40 or 80)	$29.95
Matching case & knob set, CQRP	$12.95

20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in *QST* and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.

Your choice of bands (Specify band: HR-20, HR-30, HR-40, HR-80)	$27.95
Matching case & knob set, CHR	$12.95

E-Z KEY CMOS KEYER

Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.

CW-7 kit	$24.95
Matching case knob set, CCW	$12.95

ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!

AA-7 Kit	$24.95
Matching case & knob set, CAA	$12.95

SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.

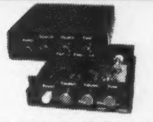
SS-7 kit	$29.95
Matching case & knob set, CSS	$12.95

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12″ antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!

Shortwave receiver kit, SRI	$27.95
Shortwave converter kit, SCI	$24.95
Matching case set for SRI, CSR	$12.95
Matching case set for SCI,CSC	$12.95

2, 6, 10 MTR, 220 FM RECEIVERS



Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.

FM communications receiver kit ... $29.95

Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)

Matching case & knob set, CFR ... $12.95

FM STEREO TRANSMITTER

Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!

FM-10 kit	$29.95
Matching case set, CFM	$12.95

AIRCRAFT RCVR

Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110–136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.

AR-1 kit	$24.95
Matching case set, CAR	$12.95

TERMS Satisfaction guaranteed, examine for 10 days. If not pleased, return in original form for refund. •Add 7% (up to a maximum of $10) for shipping, handling and insurance. •For foreign orders add 15% for surface mail. •COD (USA only), add $4.50. •Orders under $20, add $3.00. •NY residents, add 7% sales tax. •90-day parts warranty on kits. •1-year parts & labor warranty on wired units.

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CIRCLE 34 ON READER SERVICE CARD

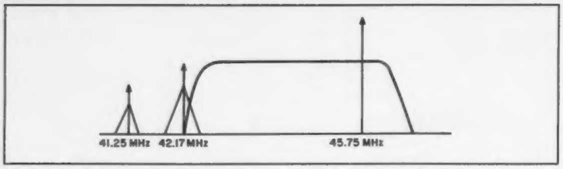

41.25 MHz
42.17 MHz
45.75 MHz

Figure 6. Spectrum of an upper sideband TV signal after it has been frequency-inverted by a higher local oscillator.

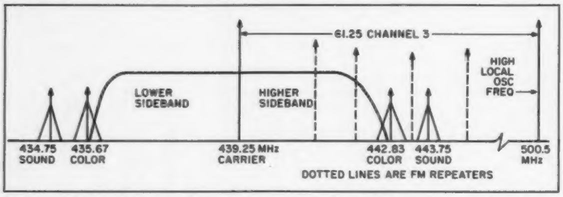

61.25 CHANNEL 3
LOWER SIDEBAND
HIGHER SIDEBAND
HIGH LOCAL OSC FREQ
434.75 SOUND
435.67 COLOR
439.25 MHz CARRIER
442.83 COLOR
443.75 SOUND
500.5 MHz
DOTTED LINES ARE FM REPEATERS

Figure 7. Higher local oscillator at 500.5 MHz converts the lower sideband of the ATV signal to an interference-free signal.

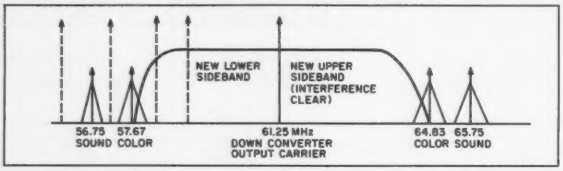

NEW LOWER SIDEBAND
NEW UPPER SIDEBAND (INTERFERENCE CLEAR)
56.75 SOUND
57.67 COLOR
61.25 MHz DOWN CONVERTER OUTPUT CARRIER
64.83 COLOR
65.75 SOUND

Figure 8. Resulting downconverter spectrum after higher frequency oscillator inverts spectrum.

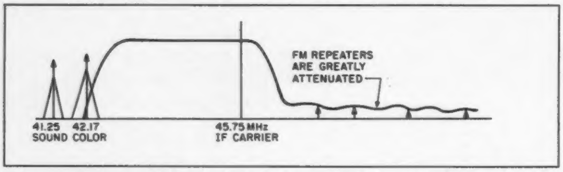

FM REPEATERS ARE GREATLY ATTENUATED
41.25 SOUND
42.17 COLOR
45.75 MHz IF CARRIER

Figure 9. Lower sideband of transmitted ATV signal in the passband of the IF amplifier, showing the attenuation of the FM voice repeaters.

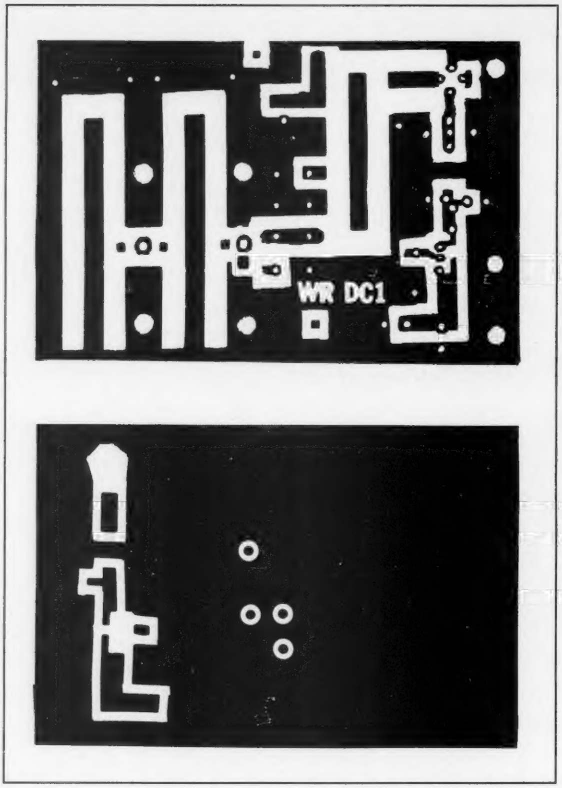


Figure 11. (a) PC board foil pattern (top layer). (b) bottom layer foil pattern.

cy selection tuning is done by the Local Oscillator (L.O.). In older TV sets, this frequency, as well as the RF tuning, was done by a channel selector, but in new sets, varactor electronic tuning eliminates the need for these mechanical nightmares. To receive an incoming signal, e.g., Channel 3, on 61.25 MHz, the vestigial one-sided spectrum must be converted to such a frequency that the intermediate frequency amplifier, known as the IF, can amplify it. Since all channels must be converted to this IF frequency, a frequency must be chosen that is least likely to be interfered with. Various intermediate frequencies were used in early TV sets, but interference from other services was found to be very bad. Later, an IF frequency near 45 MHz was chosen. It has worked very well for the last few decades.

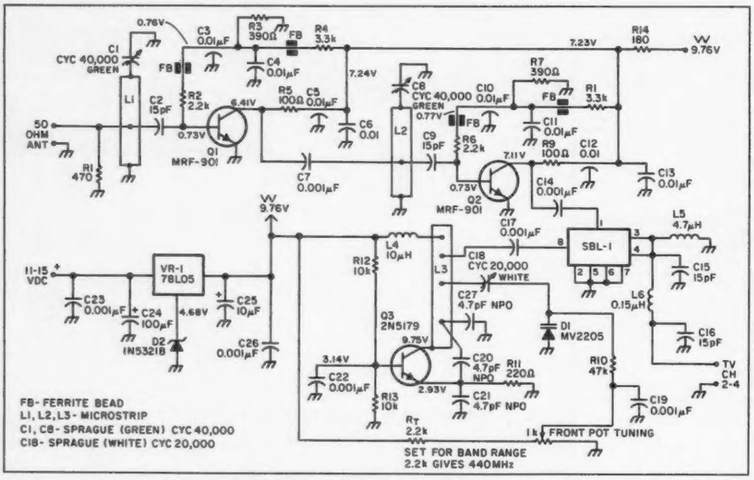
The second design standard that must be set is placement of the L.O. A frequency above or below the IF is acceptable. The L.O. frequency can be 61.25 plus 45.75 = 107.00 MHz, or 61.25 minus 45.75 = 15.50 MHz. The TV receiver manufacturers decided to use the higher L.O. frequency. The IF amplifier cannot tell which L.O. was used. The higher L.O. ensures that the oscillator does not fall in any VHF TV channel when the receiver is tuned to VHF channels 2–13.

When UHF came along, the same standard was used. It was desired to use the unsymmetrical IF amplifier response set up for VHF reception. This is what has created a problem for ATVers on 439.25 MHz.

Now, the Fix

Figure 5 shows the conversion spectrum of the Channel 3 TV signal. Remember that the upper sideband is the chosen sideband transmitted commercially. When this upper sideband is received, it becomes LOWER SIDEBAND in the IF amplifier. This is shown in Figure 6.

When ATV came along, it was easy to build a downconverter that would convert 439.25 MHz to Channel 3 or some other low frequency channel. If Channel 3 was the


0.76V
C1 CYC 40,000 GREEN
FB
C3 0.01µF
R3 390Ω
FB
R4 3.3k
C4 0.01µF
7.24V
R2 2.2k
L1
C2 15pF
6.41V
R5 100Ω
C5 0.01µF
C6 0.01
50 OHM ANT
R1 470
0.73V
Q1 MRF-901
C7 0.001µF
9.76V
C8 CYC 40,000 GREEN
0.77V
FB
C10 0.01µF
R7 390Ω
FB
R1 3.3k
7.23V
R14 180
9.76V
L2
C9 15pF
R6 2.2k
C11 0.01µF
R9 100Ω
C12 0.01
7.11V
0.73V
Q2 MRF-901
C14 0.001µF
C13 0.01µF
11-15 VDC
VR-1 78L05
C23 0.001µF
C24 100µF
4.68V
D2 1N5321B
C25 10µF
C26 0.001µF
R12 10k
L4 10µH
L3
C17 0.001µF
C18 CYC 20,000 WHITE
SBL-1
1
2
3
4
5
6
7
8
L5 4.7µH
C15 15pF
L6 0.15µH
C16 15pF
C27 4.7pF NPO
Q3 2N5179
9.75V
D1 MV2205
3.14V
C22 0.001µF
C20 4.7pF NPO
R11 220Ω
2.93V
C21 4.7pF NPO
R10 47k
TV CH 2-4
C19 0.001µF
R13 10k
RT 2.2k
1k
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SET FOR BAND RANGE 2.2k GIVES 440MHz
FB- FERRITE BEAD
L1, L2, L3- MICROSTRIP
C1, C8- SPRAGUE (GREEN) CYC 40,000
C18- SPRAGUE (WHITE) CYC 20,000

Figure 10. The lower sideband ATV down converter.

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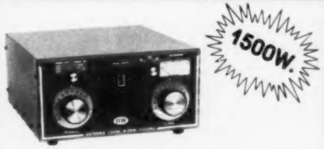

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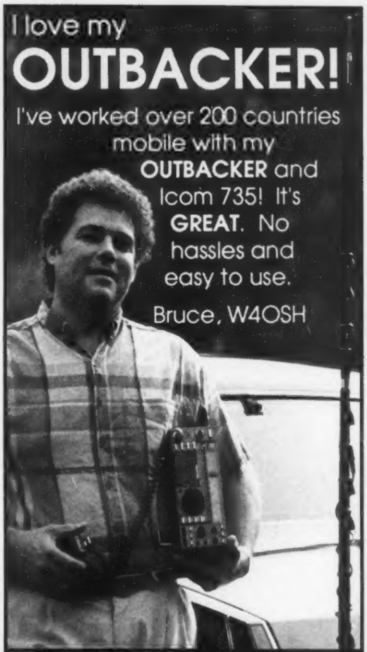

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choice, the designer of the downconverter had to decide where in the spectrum the downconverter L.O. would be placed. It is difficult to build oscillators in the UHF spectrum, so some manufacturers decided that the L.O. should be placed on the low side of 439.25 MHz, or 439.25 −61.25 = 378 MHz. The other choice would have been 439.25 + 61.25 = 500.5 MHz which would result in lower sideband detection.

The lower frequency L.O. choice was also influenced by falsely concluding that the upper sideband of the two-sided ATV signal *must* be the sideband that is received by the TV set. Another consideration was that it is more difficult and expensive to design and build a higher frequency L.O.

Both sidebands are transmitted by many ATV transmitters, and the picture is the same whether the upper or lower sideband is recovered. Figure 7 shows how an oscillator on the high side of the ATV carrier can detect the same picture.

If the choice had been to place the ATV L.O. on the high side of the incoming signal, the lower sideband would have been detected WHERE THERE ARE NO FM REPEATERS. This mostly eliminates the FM interference. The passband of a typical TV set rejects anything on its IF higher sideband. Remember that the sidebands REVERSE in the IF amplifier. The rejection of the upper sideband in the ATV spectrum is as good as the rejection of the TV set IF amplifier. This varies from TV to TV, but the rejection is good enough to reject adjacent channels on cable TV where channels are side by side. This is different from commercial RF transmitted TV, where adjacent channels are now allowed within a certain geographical distance.

The conversion is shown in Figure 8. A typical IF passband characteristic is shown in Figure 9.

Build your own Downconverter

It is easy to build a downconverter that receives the lower sideband. If you do not wish to modify your present downconverter, why not build one yourself? Figure 10 shows a circuit that works very well for ATV and operates with the oscillator on the upper side of the received frequency.

The incoming signal is amplified by two MRF-901 transistors. Stripline inductors are used on both stages of the RF amplifiers. The oscillator is also stripline, and is varactor tuned with a potentiometer on the front panel. The mixing between the incoming signal and the oscillator is done in a 4-diode mixer. The output is filtered and put out to an F-type connector that is connected to a TV set tuned to Channels 2–4.

Each of the RF stages are decoupled with well-filtered DC voltages supplied through feed-through capacitors. The noise figure of the downconverter is excellent, and rivals the performance of more expensive GaAsFET front ends. If desired, a small GaAsFET amplifier, such as the Hamtronics LNW-432, can be put in front of the downconverter. In this case, the first stage of the downconverter can be eliminated, and the GaAsFET output is connected directly to the base connection on the microstrip of the second stage in the downconverter. You'll see some improvement in performance when using the GaAsFET preamp, although the noise figure of the MRF-901 front end is very good. Figure 10 shows the circuit diagram of the lower sideband downconverter. Figure 11 shows the printed circuit board layout, top and bottom, and Figure 12 the parts layout.

Tune-Up and Operation

Mount your downconverter in a metal enclosure with a BNC or N connector for the antenna input and an F connector for the channel 3 TV output (you can use VHF channels 2–4). Hook up the downconverter to the VHF input of your TV set and attach a good 70 cm antenna to the BNC or N connector.

Power up the downconverter (use a 12-volt supply) and set your TV set for channel 3. Use channel 2 or 4 if you have a strong local station on 3. Have a nearby station who can transmit a low power signal on the low end of the band on either 421.25 or 426.25 MHz (or look for the output of an ATV repeater), adjust the front panel tuning potentiometer for the low end of its range and adjust capacitor C18 until you see a picture. If you find that you cannot tune high enough, you may have to use a lower value resistor for Rt (try 2.0k instead of 2.2k in this instance).

If you can't generate anything on the low end, just have someone send on 434 or 439.25 MHz, and tune the potentiometer to

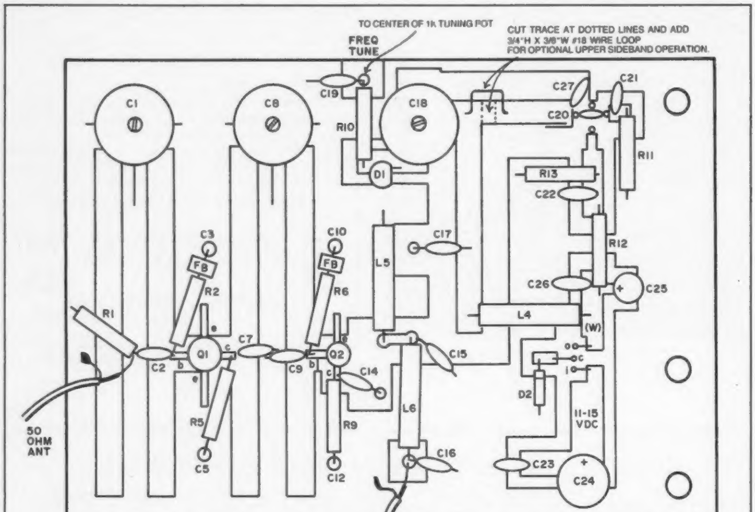

Figure 12. (a) The mechanical layout on top of the PCB. Mount components right on top of the board. To modify the circuit for upper sideband receive, cut the trace indicated by the dotted lines (L3) and attach a 3/4" high by 3/8" wide #18 wire loop to bridge the gap as shown in bold lines. (b) The bottom of the PCB. Note that Q3, the SBL-1 and the other components shown here are soldered to this side of the board.

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CIRCLE 121 ON READER SERVICE CARD

the upper end of its range. Then just adjust C18 for a picture.

Once you receive an image, have the transmitting station reduce his power or move his antenna until you have a weak, snowy picture. Now peak capacitors C1 and C8 for the strongest image.

Selectable Sideband Options

If you have no interference problems on 439.25 MHz in your area, or operate on other frequencies in the band (434, 427.25, 426.25 or 421.25 MHz), you can use this downconverter to receive regular upper sideband transmissions by cutting the trace to the right of C18 (see option in Figure 12a) and adding a 3/4" high by 3/8" wide #18 wire loop to bridge the gap. You will need to do this if you are receiving ATV transmitters or repeaters that use vestigial sideband filtering.

For the more adventurous, you can add the loop for upper sideband receive, then mount a small relay on the bottom of the PC board so that the pins short out this gap when activated. That way you can receive upper sideband ATV in one position, and lower sideband when the relay is closed. You'll have to experiment around to find the right length of the #18 wire loop so that you tune the same frequency whenever the relay is activated. Otherwise you'll have to readjust the tuning potentiometer or tweak C18.

The ATV LSB Downconverter

R1	470 ohms
R2,6	2.2k ohms
R3,7	390 ohms
R4,8	3.3k ohms
R5,9	100 ohms
R10	47k ohms
R11	220 ohms
R12	10k ohms
R13	10k ohms
R14	180 ohms
C1,8	1–10 pF variable, Sprague, CYC 40,000 (green)
C18	1–15 pF variable, Sprague, CYC 20,000 (white)
C2,9,15,16	15 pFdisc
C3,5,10,12	0.01 feed-thru noncritical value
C4,6,11,13	0.01 µF disc
C7,14,17,19,22,23,26	0.001 µF disc
C20,21,27	5 pF NPO
C24	100 µF electrolytic
C25	10 µF electrolytic
L4	10 µH choke
L5	4.7 µH choke
L6	0.15 µH choke
Q1,2	MRF-901
Q3	2N5179
VR1	78L05
D1	MV2205
D2	1N5231 Bzener
SBL-1	double balanced mixer Mini-Circuits

Note: A blank PC board is available for $10 from the author at Wyman Research, Box 95, RR #1, Waldron IN 46182, or call (317) 525-6452. The following hard to find parts are also available: Sprague CYC 40,000 and CYC 20,000 variable capacitors at $4 each and the SBL-1 double balanced mixer for $5.

After you've done your tune-up procedure, you should be ready to join in on all the ATV action and you'll keep the voice repeaters interference out of your picture in the process. ■

Don C. Miller W9NTP, Box 95, RR 1, Waldron IN 46182.

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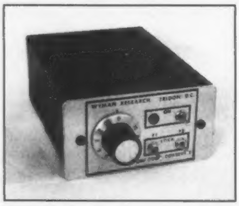

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  DC-2 with crystal option ..... $174.95 Shipping $4.50

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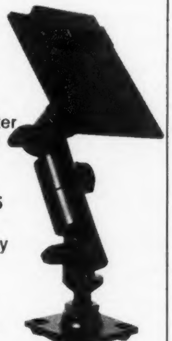

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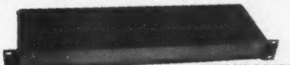

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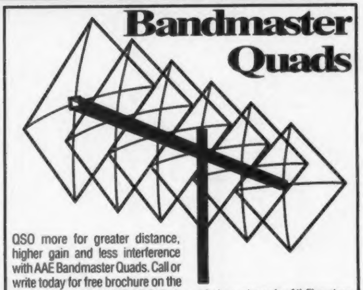

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Continued from page 14

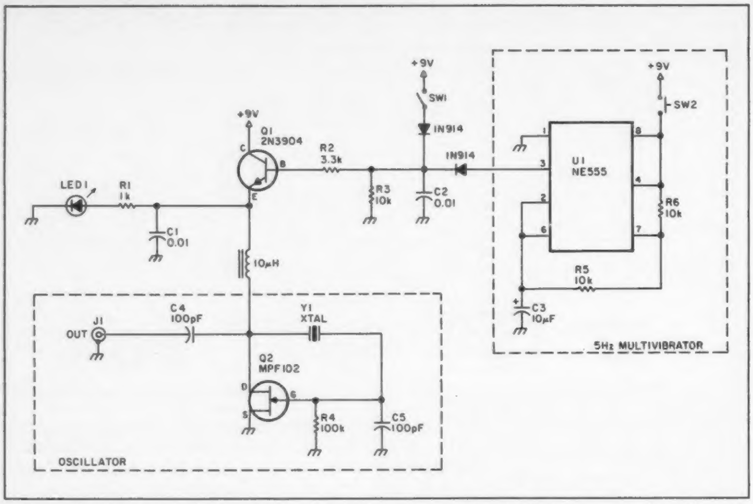

Figure 1. The "crystal chirper" circuit. Its heart is a simple JFET Pierce crystal oscillator.

diodes to ground) can be any value from 0.001 to 0.1 µF.

The RF choke can be just about any value from 10 µH through 2.5 mH. The 100 µH choke Radio Shack sells works fine, although it's a bit large for a small project. If you want to wind a smaller choke, 15 turns of number 24 or 26 wire on an FT37-43 or FT50-43 ferrite toroid produces a choke in the neighborhood of 100 µH.

The 10k resistors and 10 µF capacitor connected to the 555 are fairly critical—they set the pulse rate of the 555 circuit. You can change their value slightly if you'd like faster or slower pulses. Reducing the resistance or capacitance will speed up the oscillator; increasing either will slow it down.

Even the supply voltage is not critical. The circuit will operate anywhere from about 6 volts up to 18 or so.

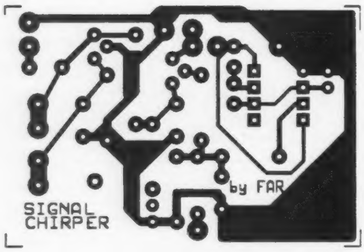

Figure 2. The PC board foil pattern for the pulsed signal source.

Adjustment and Calibration

There's not much to adjust on this project. It should work the first time you turn it on. Plug a crystal into the circuit and switch on S1. If you have an oscilloscope, check for RF at the output jack.

If you don't have an oscilloscope, you can use a receiver to test the chirper. If you built the project in a shielded enclosure, you'll need a small wire "antenna" like the one shown in Photo A. If your version of the chirper is unshielded, place the project near your receiver and tune around near the crystal frequency. You should hear a steady tone when S1 is switched on, and a pulsed tone when you switch S1 off and press S2. The LED should also light steadily when S1 is on, and flash when you press S2.

If you have S1 switched on, don't expect the circuit to pulse when you press S2. The two 1N914 diodes make an OR gate—either pulses from the 555, or steady DC through S1 will turn on the oscillator. Once S1 is on, pulses are simply ignored. If you have any problems, check your solder connections, and then make sure supply voltage is flowing to all the appropriate points in the circuit.

If the LED comes on when S1 is on, but it does not flash when you press S2, something is wrong with the 555 oscillator. Once you have the LED behaving, if there's still no output, check your connections in the crystal oscillator portion of the circuit. Then, try a different crystal; some older FT243 crystals can become corroded and stop working. Next, if the supply voltage at the drain of Q2 seems adequate, and you've tried a few different crystals, try substituting a different transistor for Q2. Finally, experiment with the value of the 100 pF capacitor from the gate of Q2 to ground.

I had fun building this project, and I use it often. I'm sure you'll find it easy to build, and it will be a valuable addition to your test bench or operating table. Now that you'll be right on frequency, put that simple transceiver on the air! ■

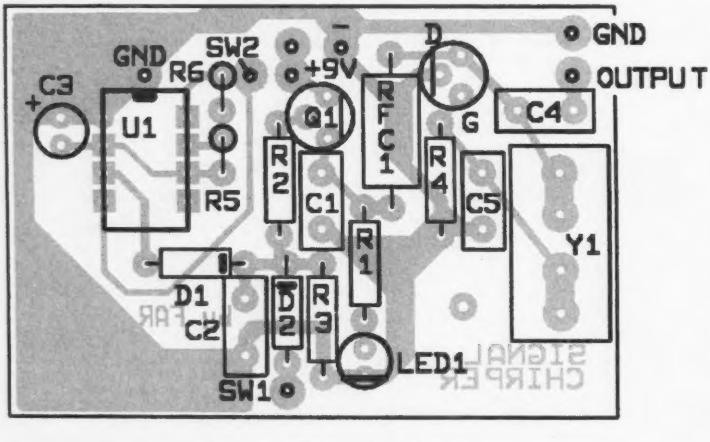

Figure 3. PC board parts placement.

Leslie K. Bartoloth, 2238 168th Ave. N.E., Bellevue WA 98008.

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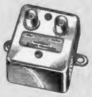

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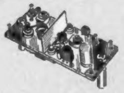

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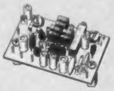

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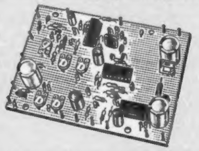

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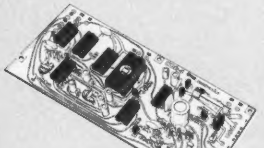

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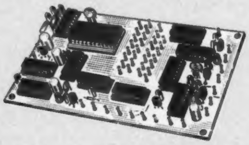

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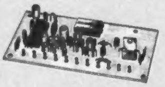

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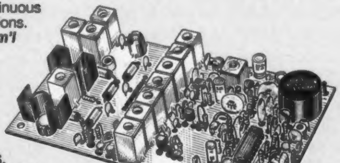

FM EXCITERS: 2W continuous duty. TCXO & xtal oven options.
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- **TA51**: 143-174, 213-233 MHz ...kit $109, w/t $189.
- **TA451**: 420-475 MHz ...kit $109, w/t $189.
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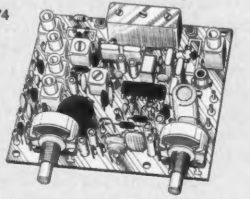

FM RECEIVERS:
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- **R76 ECONOMY FM RCVR** for 28-30, 50-54, 73-76, 143-174, 213-233 MHz, w/o helical res or afc. ...Kits $129, w/t $219.
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Using RS-12

Work the world with this unique satellite.

by Pat Gowen G3IOR

[The RS-12/13 amateur radio transponders were launched from Plesetsk, Northern USSR, on February 5, 1991, as an attachment on the USSR COSMOS-2123 navigational satellite, sharing the same power supply and housing. They went into a polar 82.9°-to-earth-equator 1,000 km high orbit which takes 104.8 minutes to circle the earth. RS-12 and RS-13 are both free for use by all of the earth's radio amateurs.]

Most satellite enthusiasts are, like most trackers and computers, geared to working their satellites of interest from "AOS" to "LOS," i.e. from the moment it appears above their terrestrial horizon, the "Acquisition of Signal," to the "Loss of Signal" point, when it normally disappears until the next pass. Unless intense "E" layer ionization or pre-auroral F2 enhancement exists to help re-angulate the uplink and/or downlink signals to and from satellites, it is rarely possible to use the VHF and UHF transponders more than 3° below the user horizon. This limitation is not the case with HF satellites, as the signals are often above or close to the MUF (Maximum Useable Frequency), considerable re-angulation of the uplinks and downlinks can result as they pass through the active layers.

Another phenomenon is also apparent at HF that is the reverse of what you would expect for UHF/VHF transponding. While the 2m and 70cm downlinks are always heard immediately after the source of the signal is above the horizon, the low angle of incidence, hence the long traverse through the E and F layers at horizon, can attentuate 29 MHz downlink signals close to extinction, and the 21 MHz uplink totally so that "K" mode access is impossible even with high power!

It is these factors that make RS-12/13 so fascinating a propagation path indicator, and a super-DX satellite to boot! This effect is not new; way back in the early days of OSCAR-6, both DJ2RE and G3IOR wrote papers on this phenomenon of the 29 MHz downlink. Both G6RH and G3IOR exploited it to the full in order to work a number of stations that were "officially" out of mutual access so as to earn "DXCC Satellite" when only 72 active countries were in theoretical range of them.

UoSAT OSCAR-9 followers will recall that the 29 MHz beacon would invariably appear long before the 145 MHz telemetry, the 21 MHz before this, and the 14 MHz even more than 20 minutes before the official "AOS." The 7 MHz beacon was never heard, as it was unable to penetrate through the ionized layers at that very low frequency. Similarly, OSCAR-6 and 7 users, as well as past and current "RS" series enthusiasts, will all have heard the 29 MHz beacon coming in long before (and long after) those times when the 2m uplink could access the spacecraft transponder. The European users suffered the agony of hearing JA, W6 and 7, Pacific Island and far South America and other mouthwatering DX which could not be worked due to limitations of the "line of sight plus a bit" VHF uplink signal path.

RS-12 on mode "K," 21 MHz up from earth to the satellite, 29 MHz down from satellite to earth, offers no such uplink and limitation frustrations! Not only can it provide excellent sub-horizon audibility, but access to the transponder as well! Although only some 600 miles high, due to the propagational anomalies at HF, RS-12 on Mode "K" can put you in range of all of earth's continents. The results are very different from those found on the Mode "A," "B," "J," and "L" transponders, where antipodal stations have no common time view, even at 34,000 km satellite height apogees. The 21 MHz uplink will re-angulate to an even greater degree than RS-10's 29 MHz downlink.

Despite the enormous possibilities, no more than 40 stations in all of Europe, and some 100 different stations worldwide, are to be heard using RS-12's "K" mode. Only eight stations are regularly active in the UK, only 30 in Europe, and only 15 have been worked from W1, 2, 3, 5, 8, 9 and 0. Surprisingly few HF "F2" operators seem even to know of the existence of RS-12, as few among their ranks seem to follow the exciting developments happening in the world of amateur radio satellites. It is perhaps because many HF operators associate satellites with the terrestrial limitations of VHF and UHF, the need for additional costly specialized equipment, and possibly because many believe that satellite operating is an art outside the normal run of their communications.

With RS-12's mode "K" none of these assumed limitations apply because we have now in orbit the new Soviet HF transponding satellite, the brainchild of Leo Labutin UA3CR. It uses the high frequency amateur bands and the basic equipment that most licensees have in their shacks, and does not require extensive high-gain beams either.

RS-12 Transponder Basics

The new Soviet RS-12 satellite has its uplink receiver listening to a 40-kHz-wide segment of the 15m band, and sending the content out again in similar 40-kHz-wide sections of 10m, and sometimes the 2m band as well. Despite transponding only a few tens of milliwatts per signal, it produces strong downlinks in the 10m (and when in mode "T" or "KT," the 2m) band, which may be heard sandwiched between the 25 wpm Morse CW telemetry beacon and the multiple speed CW ROBOT.

Telemetry

Although little active recently, the 25 wpm 2m CW telemetry beacon is centered on 145.9132 MHz, shifting from 145.9164 to 145.9100 during an overhead pass, due to the Doppler effect. The 10m beacon, which is on continuously, shifts from only 29.4086 to 29.4074 MHz. The telemetry will tell you all about the temperature, voltage, power, attentuators and general housekeeping parameters in different sections of the transponder and satellite. Table 1 lists all of these, but I will describe some of the more useful values and translation, as they will tell you what on-board devices are active and, among other indicators, the receiver's input attenuation.

Channel 3, if indicating IAS, IAD, IAR, or IAG, shows that the 15m receiver −10 dB attenuator is in circuit, while if it reads IAU, IAK, IAW, or IAO, no attenuation is in. The number following this shows the output power of the 10m transponder transmitter in watts by merely dividing the number sent by 10.

Channel 7 indicates the power level of the 10 meter No. 1 beacon on 29.407 MHz, where if NAS, NAD, NAR or NAG is sent, is minimum at 0.45W.

Channel 8 is the same for the second beacon on 29.453 MHz, where NMS, NMD, NMR and NMG all indicate the maximum power 1.2 watts of output power in use, while NMU, MNK, NMW and NMO all show that 0.45 watts, the minimum power output, is in use.

Channel 14 gives the attenuation of the 15m ROBOT receiver, with MNS, MND, MNR and MNG all showing −10 dB attenuation, while MNU, MNK, MNW and MNO all indicate that there is no attenuation in the front end. The number following this shows the ROBOT AGC voltage, as dividing the number transmitted by five will give the AGC in volts.

By observing and using these values, you will get much information on path attenuation and sub-horizon signal enhancement, giving an excellent ionospheric top-sounder for use in the experimental work and propagation research.

Robot Auto QSO'er

The ROBOT is a very clever fellow who

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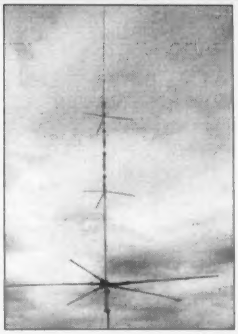


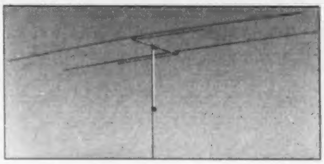
Ideal where space is limited. This easy to assemble HF vertical antenna features stainless steel hardware and a trap design at an attractive price. It can be assembled with the radials to one side for mounting close to a wall.

- Stainless steel hardware
- Ground plane design mounts at any height

- Max. Input: 500W SSB, 250W CW
  3.5 MHz - 200W SSB
- Height: 20', 5 Radials (Longest: 4' 3")
- Connector: SO239 Jack

Order #	Price	Description	Weight
HSVK5JR	**287.00**	5 Band HF Vertical Antenna	17 lbs., 8 oz.

HB9CV Type UPS Shippable



Dual driven elements at an affordable price. These high quality 6 and 10 meter antennas have an outstanding design that has gained wide acceptance for being dependable as well as compact.

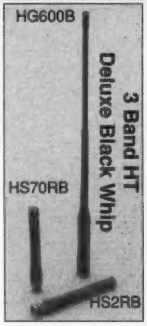
50HS2HB – 6 Meter
- Max. Input: 500W (SSB), 250W (FM)
- Gain: Better than 6.0 dB
- FBR: Better than 16 dB
- Element Length: 2,970mm/9' 8"
- Boom Length: 780mm/2' 7"
- Connector: SO239 Jack

28HS2HB – 10 Meter
- Max. Input: 500W (SSB), 250W (FM)
- Gain: Better than 6.0 dB
- FBR: Better than 16 dB
- Element Length: 5,400mm/17' 8"
- Boom Length: 1,340mm/4' 5"
- Connector: SO239 Jack

Order #	Price	Description	Weight
28HS2HB	**99.50**	28MHz, 10 Meter Horizontal Beam	7 lbs., 13 oz.
50HS2HB	**69.50**	50MHz, 6 Meter Horizontal Beam	5 lbs., 10 oz.

AH212
Features
- Freq.: 144/440/1200MHz
- Gain: - U 144MHz
  3.0dB 440MHz
  5.5dB 1200MHz
- Max. Input: 20W (FM)
- Length: 350mm/14"
- Connector: BNC Male

Compact helical formed antennas are flexible and forgiving. Two short single band models and two multi-band designs with coverage to 900 or 1200MHz with gain on the UHF bands. The HG and AH models feature a black low gloss finish, and the HS models are grey silicone rubber.

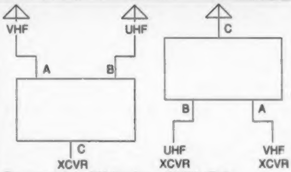


HG600B
Features
- Freq.: 144/440/900MHz
- Gain: - U 144MHz
  1.9dB 440MHz
  3.6dB 900MHz
- Max. Input: 10W (FM)
- Length: 320mm/12.5"
- Connector: BNC Male

HS2RB, HS70RB
Features
- Material: Silicone Rubber
- Max. Input: 5W (FM)
- Length: 110mm/4.33"
- Connector: BNC Male

Order #	Price	Description	Weight
AH212	**44.80**	144/440/1200MHz Whip Antenna	4 oz.
HG600B	**37.80**	144/440/900MHz Whip Antenna	4 oz.
HS2RB	**12.80**	144MHz Whip Antenna	8 oz.
HS70RB	**12.80**	440MHz Whip Antenna	8 oz.

HS790WP
HS790D/DN



- **Frequency:** Port A – 1.6 to 150MHz
  Port B – 410 to 460MHz
  Port C – Common
- **Insertion Loss:** Port A-C – 0.15dB
  Port B-C – 0.25dB
- **Isolation:** Port A-B>60dB
- **VSWR:** <1.2
- **Size (HxWxD):** 1.2" x 2.5" x 1.9"
  (Excluding Connectors)
- **Power:** 1.6 to 30MHz Max. 500W (FM)
  50 to 150MHz Max. 300W (FM)
  410 to 461MHz Max. 300W (FM)
- **Connectors:**

	A	B	C
HS790D	UHFm	UHFm	UHFf
HS790DN	UHFm	Nm	UHFf
HS790WP	UHFf	UHFf	UHFf

m=male, f= female

- **Weather Proof Model:** HS790WP comes with mounting bracket and stainless steel clamp

Order #	Price	Description	Weight
HS790D	**47.50**	Direct Link Duplexer	9 oz.
HS790DN	**47.50**	Direct Link Duplexer	9 oz.
HS790WP	**58.00**	Direct Link Duplexer, Weather Proof	14 oz.

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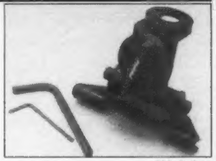

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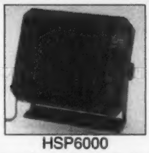
- Universal
- Zinc Die-Cast
- Adjustable Mounting Angle

Order #	Price	Description	Weight
BM1	**29.00**	Trunk/Hatch Mount	13 oz.



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Size: 4.33" x 5.32" x 2.13" (HxWxD)

Commercial Grade External Communications Speakers

- Impedance: 8Ω
- Connector: 3.5mm plug

HSP7000

2.75" fixed cone speaker with high quality, deluxe magnet mount

Size: 3.51" x 4.06" x 1.42" (HxWxD)

Order #	Price	Description	Max. Input	Weight
HSP6000	**29.00**	4" Fixed Cone Speaker	15W	15 oz.
HSP7000	**37.00**	2.75" Fixed Cone Speaker	8W	13 oz.

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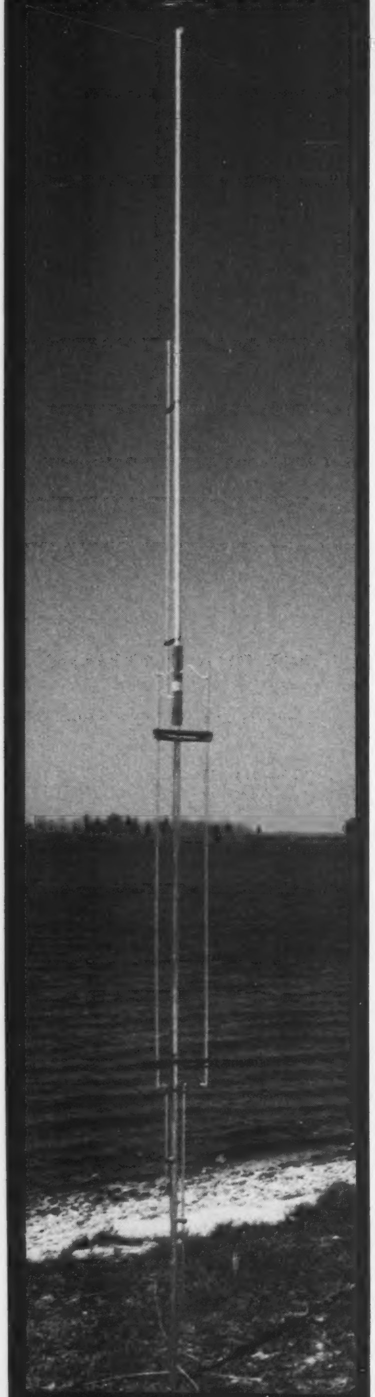

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RS-12/13 Telemetry Data Conversion

The telemetry from RS-12 and 13 is sent down as Morse code CW at around 25 wpm. It represents various status indicators and measurements made on the transponder. There are 16 channels sent. Each channel sent consists of 3 alpha characters followed by 2 numeric characters; for example: IMS 45. The "IMS" part is the alpha. The "45" is the numeric part of one channel. The alpha part gives a specific status, such as "on" or "off" for a specific feature. In the example "IMS 45," the "IMS" part gives the specific status of Channel 4; the 21 MHz receiver is off. If, however, "IMS"is replaced by "IMU" in Channel 4, as in "IMU 45," then the 21 MHz receiver is activated (on). The numeric part of Channel 4, "45" in our example, gives the AGC level of the 15 meter receiver, where the value in volts equals the number sent divided by 5 (N/5 = V; 45/5 = 9 volts).

Channel	Alpha Group	Meaning/Conversion Formula
1	IIS IID IIR IIG	Telemetry sampling period: 90 min.
	IIU IIK IIW IIO	Telemetry sampling period: 10 min.
		N/4 = V in volts of power supply
2	INS IND INR ING	2m RX: 20 dB, attenuator on
	INU INK INW INO	2m RX: 0 dB, attenuator on
		N/10 = P in watts, power output 2m TX
3	IAS IAD IAR IAG	15m RX: 10 dB, attenuator on
	IAU IAK IAW IAO	15m RX: 0 dB attenuator on
		N/10 = P in watts, power output 10m TX
4	IMS IMD IMR IMG	15m uplink: off
	IMU IMK IMW IMO	15m uplink: on
		N/5 = V in volts, 15m RX-AGC volts
5	NIS NID NIR NIG	2m RX: off
	NIU NIK NIW NIO	2m RX: on
		N/5 = V in volts, 2m RX-AGC voltage
6	NNS NND NNR NNG	Special command station channel: off
	NNU NNK NNW NNO	Special command station channel: on
		N/5 = V in volts, special command AGC V
7	NAS NAD NAR NAG	Output power 10m beacon no. 1: max
	NAU NAK NAW NAO	Output power 10m beacon no. 1:min
		N/3 = (service command parameter)
8	NMS NMD NMR NMG	Output power 10m beacon no. 2: max
	NMU NMK NMW NMO	Output power 10m beacon no. 2:min
		N/3 = (service command parameter)
9	AIS AID AIR AIG	Status of first memory board: off
	AIU AIK AIW AIO	Status of first memory board: on
		N–10 = T in degrees C, 10m TX
10	ANS AND ANR ANG	Status of second memory board: off
	ANU ANK ANW ANO	Status of second memory board: on
		N–10 = T in degrees C 2m TX
11	AAS AAD AAR AAG	There is information in memory no. 1
	AAU AAK AAW AAO	..... no information in memory no. 1
		N–10 = T in degrees C, 20V power supply
12	AMS AMD AMR AMG	There is information in memory no. 2
	AMU AMK AMW AMO	.... no information in memory no. 2
		N–10 = T in degree C, 9V power supply
13	MIS MID MIR MIG	Memory data send via beacon 2
	MIU MIK MIW MIO	Memory data send via beacon 1
		N/5 = V in volts, 9V pwr. supply control
14	MNS MND MNR MNG	15m ROBOT RX attenuator: –10 dB
	MNU MNK MNW MNO	15m ROBOT RX attenuator: 0 dB
		N/5 = V in volts, 15m ROBOT RX AGC voltage
15	MAS MAD MAR MAG	2m ROBOT RX attenuator: –10 dB
	MAU MAK MAW MAO	2m ROBOT RX attenuator: 0 dB
		N/5 = V in volts, 2m ROBOT RX AGC voltage
16	MMS MMD MMR MMG	Output pwr. special CMD channel: Max
	MMU MMK MMW MMO	Output pwr. special CMD channel: Min
		N = 00: Less than 32 SOs in ROBOT log
		N = 80 to 99: Over 32 QSOs in ROBOT log

Table 1. RS-12/13 telemetry data conversion. Keep this as a data sheet for your RS-12 and 13 telemetry calculations and findings. This information is provided by Pat Gowen G3IOR, with acknowledgements to RS3A, the RS Satellite Command Station, as source and to PA0DLO for relaying information.

will coolly ignore you if your Morse CW is not perfect. It will respond to your call at any speed between 8 and 50 wpm, give you a serialized QSO number, say who it is, and wish you 73 before it signs off with you to call CQ again. If QRM is present, it will tell you so. If you send too fast for it (an unlikely occurrence!) it will say "QRQ"; if you are too slow it will say "QRS," at least until it has matched your speed. "QRZ" or "RPT" will evolve if it is unsure of your callsign. The ROBOT calling frequency is 21.1297 MHz ± only 0.45 kHz Doppler shift, and as it is 3.2 kHz wide, gives no access problem. Fifty watts ERP at high angle passes, particularly at night when the high 21 MHz attenuation of the "E" layer is not manifested, will enter it readily by calling **"RS12 de G3XXX AR"** (use your own call, of course) after it has sent its CQ call. The 10m ROBOT downlink Doppler shifts from 29.4549 to 29.4535 MHz. When activated, the 2m ROBOT

Radio Sputnik 12 (RS-12)	
Beacon/ROBOT	29.408 MHz (CW)
Beacon/ROBOT	29.454 MHz (CW)
Mode A Uplink	145.910–145.950 MHz (SSB, CW)
Mode A Downlink	29.411–29.451 MHz (SSB, CW)
ROBOT A Uplink	145.831 MHz (CW)
ROBOT A Downlink	29.408 or 29.454 MHz (CW)
Beacon/ROBOT	29.408 MHz (CW)
Beacon/ROBOT	29.454 MHz (CW)
Mode K Uplink	21.210–21.250 MHz (SSB, CW)
Mode K Downlink	29.411–29.451 MHz (SSB, CW)
ROBOT K Uplink	21.130 MHz (CW)
ROBOT K Downlink	29.408 or 29.454 MHz (CW)
Beacon/ROBOT	145.913 MHz (CW)
Beacon/ROBOT	145.959 MHz (CW)
Mode T Uplink	21.210–21.250 MHz (SSB, CW)
Mode T Downlink	145.917–145.956 MHz (SSB, CW)
ROBOT T Uplink	21.130 MHz (CW)
ROBOT T Downlink	145.913 or 145.959 MHz (CW)
Radio Sputnik 13 (RS-13)	
Beacon/ROBOT	29.458 MHz (CW)
Beacon/ROBOT	29.504 MHz (CW)
Mode A Uplink	145.960–146.000 MHz (SSB, CW)
Mode A Downlink	29.460–29.500 MHz (SSB, CW)
ROBOT A Uplink	145.840 MHz (CW)
ROBOT A Downlink	29.458 or 29.504 MHz (CW)
Beacon/ROBOT	29.458 MHz (CW)
Beacon/ROBOT	29.504 MHz (CW)
Mode K Uplink	21.260–21.300 MHz (SSB, CW)
Mode K Downlink	29.460–29.500 MHz (SSB, CW)
ROBOT K Uplink	21.138 MHZ (CW)
ROBOT K Downlink	29.458 or 29.504 MHz (CW)
Beacon/ROBOT	145.862 MHz (CW)
Beacon/ROBOT	145.908 MHz (CW)
Mode T Uplink	21.260–21.300 MHz (SSB, CW)
Mode T Downlink	145.960–146.000 MHz (SSB, CW)
ROBOT T Uplink	21.138 MHz (CW)
ROBOT T Downlink	145.862 or 145.908 MHz (CW)

Table 2. Frequencies for RS-12/13. All frequencies are nominal, to the nearest kHz.

downlink goes from 145.9627 to 145.9563 MHz in an overhead pass. You will hear your own signal calling the ROBOT coming back to you as well as the response, but be warned! If you use this as your monitor, because the transit delay of the 4,000 mile maximum dual path slightly delays the return you are hearing of your own CW, it may affect your otherwise excellent Morse code! When the ROBOT is not activated for QSOs, e.g. it is not calling "CQ" at regular intervals, it may be employed as a single channel CW-only transponder.

The Channel 16 telemetry tells some of the ROBOT story. If the number sent is 00, then there are less than 32 QSOs in the ROBOT log, but if it is between 80 and 99, it is approaching capacity, as over 32 QSOs are in the log memory. You may hear digital downlink on the channel at times when RS-12 is within range of RS3A in Moscow. This is normally the log being downloaded.

Transponders

RS-12 is the system normally found on, with its sister RS-13 kept on reserve standby. The frequencies of both RS-12 and RS-13 are given in Table 2. We shall refer to RS-12, but what is given for this is also true for the alternate transponder, with only the frequencies differing.

The RS-12 Mode "K" transponder input running from 21.210 to 21.250 MHz will give a 29.411 to 29.451 MHz proportional linear return, with only some 0.9 kHz of combined Doppler shift. When active on mode "T" or "KT," it also has a downlink from 145.9167 to 145.9556 MHz, with an additive 21 and 145 MHz Doppler shift of ±3.5 kHz. If you add 124.7067 to your 21 MHz uplink, you will have (±3.5 kHz) the appropriate 2m downlink frequency. Similarly, when you add 8.201 MHz to your 21 MHz uplink, you have the downlink frequency upon which you will be present. When you move up by, say, 2 kHz on the uplink, you will also move up 2 kHz on both downlinks, as confirmed by monitoring. The total passband, given as 40 kHz, is in fact much wider, and can be heard over at least 70 kHz, e.g. 15 kHz either side of the stated band edge, albeit at reduced sensitivity and output efficiency.

In-Band Operation

As with our HF bands, the lower half of the transponder passband is for CW, the higher for SSB, with mixed modes in the center, just like our other satellites. To operate, just find a clear downlink frequency, and check that the relative uplink is clear too, as other terrestrial users may be in the uplink passband on 21 MHz. Adjust your transmitter to the appropriate calculated uplink, and you should hear your own transponded signal. Try a "CQ RS 12" or alternatively reply to another's CQ by adjusting your transmitter uplink to emerge on that frequency. You will be pleasantly surprised at who you will work on what might otherwise be a dead band. If you have a single transceiver, you may have "QSK," a rapid break in system, and hear the tail end of your transponded signal especially when the satellite is at maximum range and hence maximum return signal delay time. If you are blessed with a separate 29 MHz receiver then, aided by high-pass filters on the input to stop your 21 MHz breakthrough, you should be able to hear your own signal.

When and Where

RS-12 makes eight passes a day in range of most countries of average latitude, each pass lasting from only a few minutes to up to 19 minutes. Some skim the horizon, some go right overhead. Sub-horizon passes add considerably to useful opportunities, and in equinoxial high solar flux times the downlink may be heard and accessed for 70% of the day. To calculate the timing and exact passes, a computer program or an OSCARlator is desirable, both of which are available from AMSAT. The computer program or tracker will give you the satellite distance, azimuth, elevation, probably the Doppler shift, the range, and all you need to know to find the satellite.

Continued on page 38

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73 Review

by Bill Clarke WA4BLC

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The JPS NF-60 DSP Notch Filter

Get rid of multiple carriers with the push of a button.

Notch filter—that's the knob you madly twist when trying to block out an interfering signal such as a tuner-upper or a heterodyne. The down side of using the typical notch filter is that most of them are overly sensitive and clumsy to tune, thereby making them slow to use. In fact, the offending signal often disappears before you can notch it out.

Although the technology of notch filters has advanced over the past several years to the point that even 40 meters becomes usable during the night hours, they are still perplexing to use. But now, enter the automatic notch filter.

The automatic notch filter does all the work of its manual cousin, except that it requires no knob twisting. It locates and removes the offending signal instantaneously; the operator doesn't have to do anything to make the filter work except turn it on. New to the market is just such a filter, the NF-60 DSP Notch Filter by JPS Communications, Inc.

First Impressions

The NF-60 is manufactured right here in the U.S. Smaller than most handhelds and weighing enough to remind you that quality can be felt, the NF-60 is black and has only two controls: Power on/off and Notch on/off. On the rear panel are two RCA jacks for Audio (in/out), and a power jack for the AC adapter line.

The manual is very professionally done, yet easy to understand, and contains installation diagrams, explanations of operation, and theory.

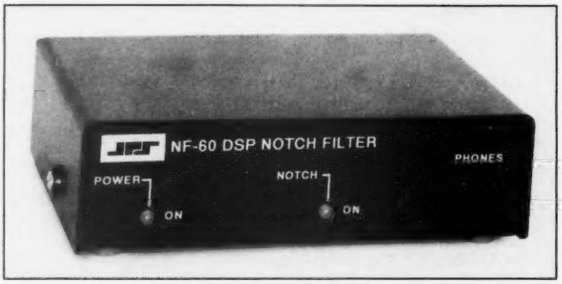

Photo A. JPS's new NF-60 Notch Filter.

Installation

Installing the NF-60 is about as simple as hooking up an external speaker, which, by the way, is essential for use of the filter. Plug the (optional) AC adapter's output line into the power jack on the rear panel of the unit. Run an audio patch line (I recommend shielded) from the Audio Input jack to the external speaker jack of your rig, and plug an external speaker into the unit's Audio Output jack. That's all there is to it!

Just in case a polarity mistake is made, you don't need to worry. The NF-60 is reverse polarity protected.

Operating with the Filter

As an initial check of the NF-60, I turned on my HF rig as normal and set it to the Canadian time clock on 7.335 MHz (and later the U.S. time clock at 15 MHz) on LSB, and tuned until I heard a steady tone. I then pushed the NF-60's Power and Notch buttons to "on" and the tone immediately went away. I tuned around the time clock to see if the tone (or any tone) could be heard again, while leaving the NF-60 on. The most I ever heard was a split second of tone before the automatic notch locked up and took it away.

Specifications

Audio Input:	unbalanced low impedance 22 ohms or 47k ohms; (phone jack)
Frequency Response:	250 to 3400 Hz ±2dB
Input Level:	100 mV to 2V rms
Output Delay:	0 milliseconds
Lock-up Time:	<6 milliseconds
Ultimate Tone Rejection:	>50 dB (1 to 4 tones) (slightly lower for 5 or more tones)
Audio Distortion:	<.5% at 1 kHz at .5W output
Headphone Output:	8 ohm or greater (stereo phone jack)
Speaker Output:	2W at 10% distortion into 8 ohm speaker (RCA jack)
Front Panel:	power switch, power LED, notch switch, notch LED
Rear Panel:	audio input, audio output, DC power input
Input Power:	+11 to +15 VDC at 250 mA (750 mA peak)
Dimensions:	1.7" x 6" x 4.3" HWD at 2 lbs.

Having proved that the NF-60 could take out tones of a very loud and steady nature, I then went to the real world of the ham bands. Of course, I left the NF-60 on. At first I thought there were no tuner-uppers around on the various 80/40/20 meter nets I tuned to. Then I turned the filter off and found the offenders were alive and well. I continued to tune around and turn the filter on and off, seeing what it could do. I even verified the claim that multiple tones could be notched out simultaneously.

The filter only notches a small segment of the audio spectrum out, so small that it doesn't destroy the quality of the remaining signal. Unless the filter was turned off, I generally never even knew the offending signals existed. The single exception to this rule was when the offending signal was strong enough to work the receiver's AGC. This caused a slight audio level reduction.

The NF-60 makes 40 meters useful at night. You can get in between those broadcasters, and their carrier tones just disappear, allowing SSB to carry on.

Although I have been using automatic notch filters for years, I must say that, due to the fast lock-up time, excellent audio quality, and multi-frequency ability, the NF-60 is the best I have heard.

Comments

The NF-60 operates on a digital signal processing scheme, and constantly looks at the audio spectrum for solid tones. When a tone is encountered, the unit immediately creates a very narrow and deep notch at that frequency, removing the tone.

As mentioned above, the NF-60 is capable of taking multiple tones out. For example, the typical RTTY signal is reduced to a series of

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clicks, without tones.

With the filter turned on, you will find that CW sounds like an old Western Union telegraph sounder's clickity clack!

The filter has a built-in audio amplifier. For normal listening levels it is very satisfactory. However, it can be driven into distortion by running the receiver's audio gain too high. I found this to be no practical limitation, as it only occurs at very high levels that drove me from the shack anyway.

It appears that the NF-60 is not susceptible to RF interference (some audio filters are). This was carefully checked on all bands using full legal limit power.

The lock-up time of the NF-60 is very fast. In fact, I found it is capable of following slow swishers.

I did find a very slight clicking sound to be mixed in with the normal output audio. I am not concerned about this, as I had to really listen closely to even hear it.

The front panel phone jack is a positive feature.

The only feature missing is an indicator (such as an LED) showing when the filter is earning its keep.

Technical Aspects

The NF-60 uses digital signal processing to find and notch out offending tones. The internal workings of the unit include a TMS320P15 DSP chip which does all the work, except for A to D and D to A conversion (which is handled by a 14-bit converter). The chip operates at 20 MHz (crystal-controlled).

When feeding the receiver modulated signals (tones), I found there was no real limit to what the NF-60 could notch out. A 60 dB over S9 signal could be eliminated (not just reduced). I also found the filter worked at very low audio settings, even at settings where the tone was barely audible. Both factors exceed specifications.

The weight of the unit is such that the push-button switches can be worked without having to chase it all over the desk.

The simplicity of operation is excellent. Turn it on and forget it. It does its job by itself.

Recommendation

I feel the NF-60 is a piece of ham equipment that does its job completely and simply. The sheer pleasure of not hearing tuner-uppers, and being able to use 40m at night between all those foreign broadcasters, is worth the reasonable cost of the NF-60. I heartily recommend that every SSB operator own one of these neat little filters (the NF-60 is only for SSB).

The NF-60 does the job it is supposed to do one hundred percent.

For a number of years I have been hollering that automatic notch filters are the greatest thing since sliced bread. You transceiver and receiver manufacturers out there: Remember how I have been saying you should include automatic notch filters in your rigs? Well, forget it! This new filter is so good I doubt you could beat it for quality or price.

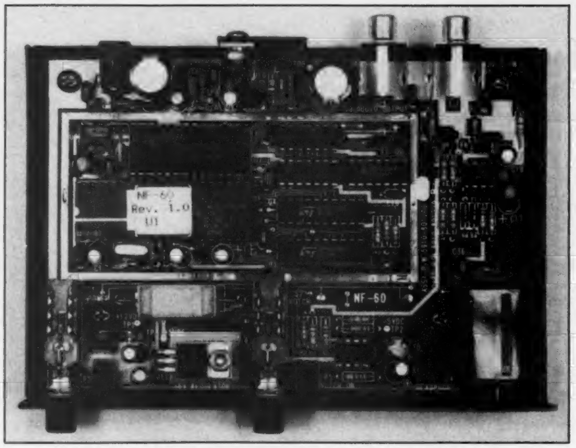

Photo B. Inside view of the filter showing the DSP circuitry.

Using RS-12

Continued from page 35

If you join the Sunday 1730 UTC 14.282 MHz pre-AMSAT Net warm-up session, the 14.280 MHz Saturday 1000 UTC European AMSAT Net, or the 75 meter AMSAT Net on 3.840 MHz (Tuesday evening at 9 p.m. local time—i.e. Wednesday at 0200 UTC), regular satellite operators will be happy to provide you with pass times and intervals for your location.

Station Needs

For the transmitter, just 50 watts to a simple dipole or ground plane will suffice, although a beam and 100 watts will perform far better for those low angle and sub-horizon times. While G3IOR uses a 21/28 MHz three-element beam at 65 feet, G2UK runs a simple 75m trap dipole only 10 feet over the ground and gets not only excellent in-range results, but sub-horizon access also.

The receiver doesn't need to be anything special, but if you have a very old tube radio, then a 10m preamplifier will improve sensitivity performance considerably. A separate transmitter and receiver will help a lot, as you may then monitor your downlink while simultaneously transmitting on the uplink. If your band switching is fast enough and your frequency calibration accurate, a transceiver will suffice.

Problems

On the downlink you may hear many stations using the 21 MHz uplink passband for terrestrial style QSO, and be surprised by the comparison between what you can hear on the satellites downlink compared to that on the corresponding uplink. Try not to QRM any users who are already on the frequency, as this section of 21 MHz is not a space-specific subband, and they have every right to be there.

On the other hand, you may find severe QRM from wide FM signals in the satellite downlink passband under high MUF propagation conditions. These stations can cause severe wideband QRM to the weaker CW and SSB satellite transponded signals, and have no absolute right to be there as the satellite downlink band is recognized as being specific as a space band. A polite request for them to move back to the FM allocation below 29.400 or above 29.510 MHz will usually result in recognition. Sadly, with FM receivers, they may not even hear the signals from the satellite, and thus may well not be aware of their transgression.

Satellite DX and Propagation

In the first few days of operation, G3IOR worked 17 countries on RS-12, including W1, 2, 3, 5, 8, 9 and 0; VE1, 2 and 3; UA0, ZL, plus many European countries, including fellow "G" and European stations. You will find that at high solar flux times you can access and hear the return even when the satellite is up to 48 degrees below your horizon, especially at pre-auroral ionosphere enhancement times. You are hence able to work the whole world! You may be horrified to hear your return as a real "T-2" note sounding much like an auroral or even equatorial zone condition due to multi-Doppler paths. You will find it to be quite fascinating, and a means of working those 21 and 28 MHz inter-skip-zone fellow amateurs, as it will reach to the parts that other propagators will not reach! It is a source of superb ionospheric data and research to boot!

RS-12 is an ideal satellite for the HF operator, who will be able to continue to work DX even when the 21 and 28 MHz bands are otherwise dead, and to work both locals and inter-continental DX via the satellite while the bands are on the edge of the MUF, as the re-angulation, while insufficient for direct terrestrial QSO, is often adequate for the low satellite angular incidence to the ionized layers. It has the added advantage that the commercial and military intruders who tend to sneak into the high ends of our depleted amateur bands in the quiet sun years will discover amateur occupancy, and thus we may maintain our precious frequencies and help forestall further cuts. RS-12 is very user friendly and is recommended to HF DX operators, newcomers, those who "have done it all," plus old and new satellite fans! Will we see you on RS-12?

The author appears regularly on the given AMSAT nets, and would be pleased to respond to any questions arising. On Packet Radio, Pat is contactable as G3IOR @ GB7VLS. #35. GBR. EU.

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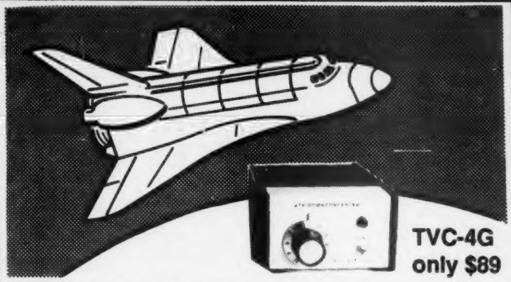

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40/80 Meter Wave Ryder

A QRP tube transmitter powered by 12 volts DC.

by Charles D. Rakes KI5AZ

If you've been looking for a new project to build that has a nostalgic quality mixed with a touch of today's technology, then look no farther because our 40/80 Meter Wave Ryder CW QRP transmitter offers these features and more.

The transmitter's circuit design is similar to the single tube crystal controlled QRP rigs that were in vogue during the fabulous '50s. A 3A4 miniature power amplifier pentode tube is connected in a crystal controlled tuned-plate oscillator circuit with a power output of 1 to 2 watts.

The circuitry's modern mix allows the transmitter to operate from a single 12-volt DC power source. A 7805 5-volt regulator IC is connected in a 100 mA constant current circuit that keeps the tube's filament glowing just right as long as the DC input stays above 8 volts.

The tube's B+ is generated on command, and to see how, take a look at the schematic diagram in Figure 1. A 555 IC timer is connected in an astable oscillator circuit with C1, R1, R2 and R9, setting the operating frequency to about 25 kHz.

Q1 holds pin 5, of the IC, at ground level while the key is in the "up" position, keeping the 555 circuit from oscillating. The majority of the battery drain at standby, or during the time between dits and dahs, is the filament current.

Each time the key is closed, the 555 circuit becomes active, supplying base drive to the MJE 3055 power transistor. The power transistor's pulsing collector current turns the 12 volt supply into about 150 volts at the secondary of T1.

The full-wave bridge circuit converts T1's output to DC, and C4 smooths out any glitches. At key-down, the tube is supplied with almost instant B+, causing the circuit to oscillate and send out a CW signal.

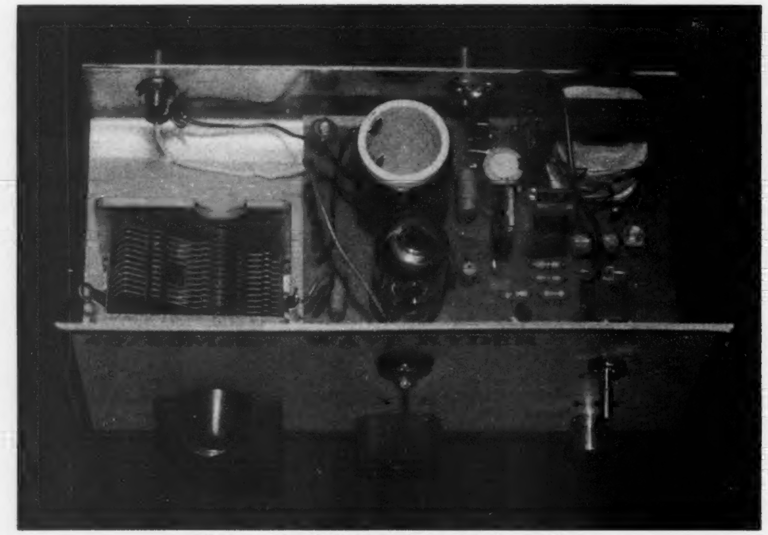
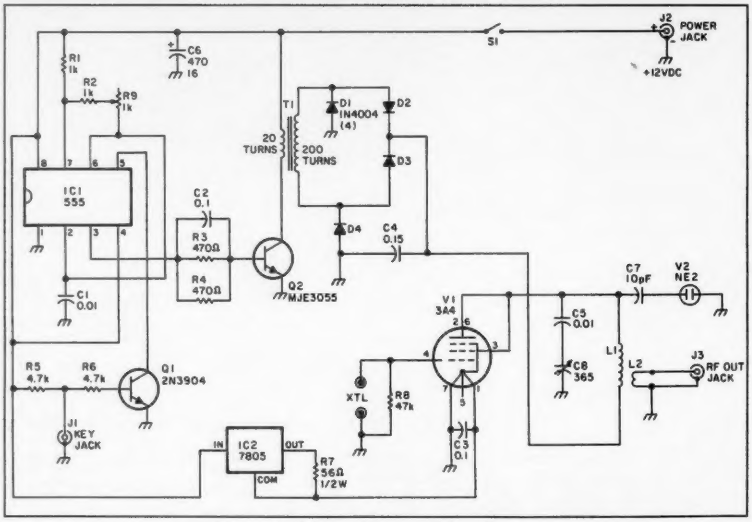
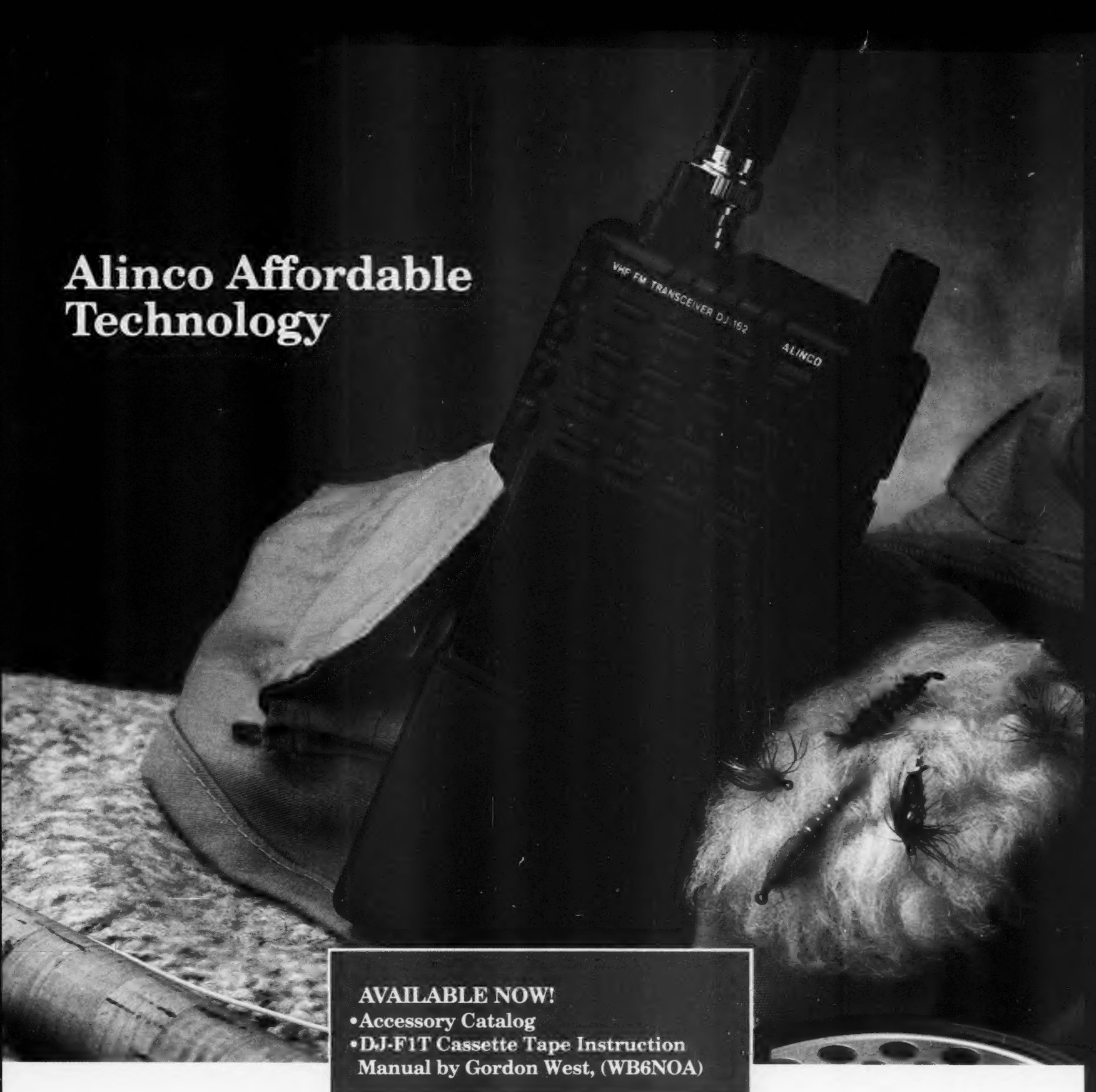


Photo A. The 40/80 Meter QRP CW Wave Ryder.


J2
POWER JACK
S1
+12VDC
C6
470
16
R1
1k
R2
1k
R9
1k
T1
20 TURNS
200 TURNS
D1
1N4004
(4)
D2
D3
D4
IC1
555
8
7
6
5
1
2
3
4
C2
0.1
R3
470Ω
R4
470Ω
Q2
MJE3055
C4
0.15
C1
0.01
C7
10pF
V2
NE2
V1
3A4
C5
0.01
C8
365
L1
L2
J3
RF OUT JACK
R5
4.7k
R6
4.7k
Q1
2N3904
J1
KEY JACK
XTL
R8
47k
C3
0.1
IC2
7805
IN
OUT
COM
R7
56Ω
1/2W
Figure 1. Schematic for the Wave Ryder.

Building the Wave Ryder

The circuit may be built breadboard style if you like, as long as the wiring is neat and the leads are kept short. Or you may take the easy route and use a PC board. If so, just follow the component placement layout shown in the



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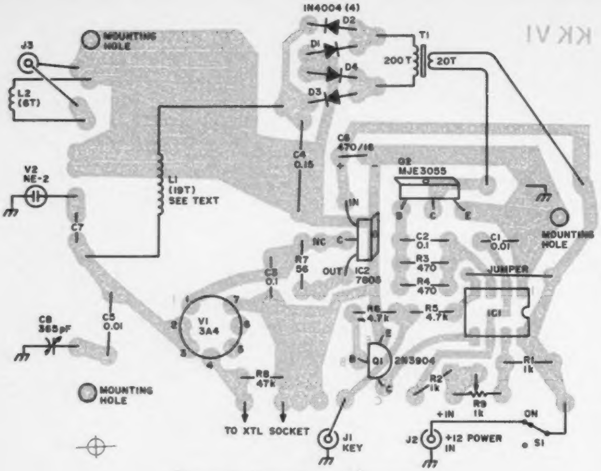


Figure 2. Parts layout diagram.

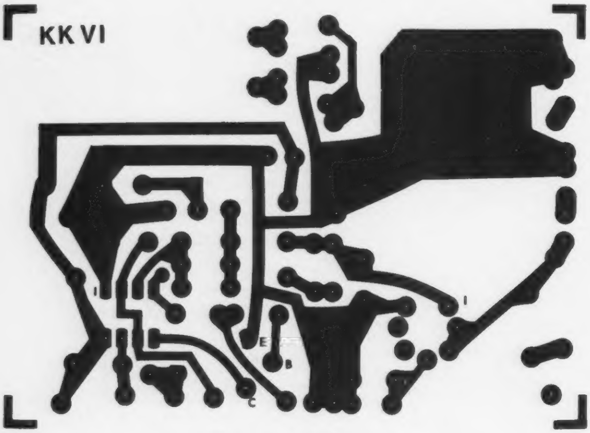


Figure 3. Foil diagram.

Parts List

C1	0.01 µF/100V	Mylar
C2,3	0.1 µF/50V	disc ceramic
C4	0.15 µF/250V	Mylar
C5	0.01 µF/630V	Mylar
C6	470 µF/16V	electrolytic
C7	10 pF/500V	disc ceramic
C8	365 pF variable	broadcast type
D1–4	1N4004 1 amp	silicon
IC1	555	timer
IC2	7805 5V	regulator
Q1	2N3904	transistor
Q2	MJE 3055 power	transistor
V1	3A4 miniature power amp	pentode tube
V2	NE-2 or similar	neon lamp
R1,2	1k 1/4W	resistor
R3,4	470 ohm	resistor
R5,6	4.7k	resistor
R7	56 ohm 1/2W	resistor
R8	47k 1/4W	resistor
R9	1k trim pot	single turn
J1–3	RCA jacks	phono
S1	Small switch	toggle on/off
T1	EA-77-375 core and bobbin	Amidon*
L1,2	see text	
Misc.	Chassis, circuit board, knob, grommet, crystal socket, hardware, wire, etc.	

*Amidon Associates, Inc., 2216 East Gladwick St., Dominguez Hills CA 90220. Tel. (213) 763-5770.

You can get a kit of parts for the Wave Ryder, including the circuit board and all components that mount on it and parts for T1 (less winding wire), a coil form, and five socket contacts, all for $24.95 postpaid, from Krystal Kits, P.O. Box 445, Bentonville AR 72712, or call (501) 273-5340 and ask for KI5AZ.

You will have to furnish the chassis, tuning capacitor, neon lamp, grommet, power switch, crystal socket, jacks, tube, wire and hardware to complete your TX. A PC board only is available for $7.95 postpaid, and five Concord socket contacts are available for $3.00 postpaid.

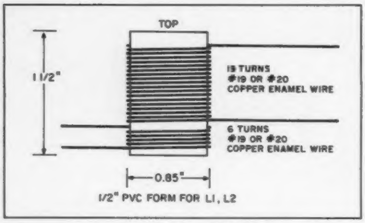

TOP
1 1/2"
19 TURNS #19 OR #20 COPPER ENAMEL WIRE
6 TURNS #19 OR #20 COPPER ENAMEL WIRE
0.85"
1/2" PVC FORM FOR L1, L2

Figure 4. A piece of 1/2" PVC pipe serves as the coil form for L1 and L2.

PC foil pattern drawing in Figure 2, and stuff the parts on the board. The tube socket is made up of five Concord #09-9006 socket pins (cost of five is less than two bucks) soldered in place on the circuit board. But you can also use a regular tube socket and wire it to the circuit board with short leads.

Winding T1

The transformer's two windings are wound on the nylon bobbin supplied with the Amidon EA-77-375 "E" core. Wind 20 turns of #26 copper enamel wire in a solenoid fashion on the bobbin. On both windings, leave at least three inches of wire at each end to connect to the circuit board. Place a layer of plastic tape around the winding to complete the primary. On top of the primary winding, wind 200 turns of #26 copper wire for the secondary and tape in place. Place the bobbin between the two cores and tape or glue in place.

Winding L1/L2

The tank circuit is wound on a 1-1/2" length of 1/2" PVC cold water pipe that actually measures 0.85" in diameter. Just about any hardware or plumbing shop will have the PVC pipe on hand.

Refer to Figure 4, and close wind 19 turns of #19 or #20 copper enamel wire on the form for L1. Space down the form about the width of two turns, and wind 6 turns of the same size wire for L2. An easy way to keep the windings in place and looking neat is to drill two wire size holes for each wire end, and fish through for a snug fit.

Making the Chassis

Since cabinets are so expensive and difficult to find, the Wave Ryder was constructed on a piece of 0.05-inch thick aluminum cut to 7" x 5-3/4". To duplicate our Wave Ryder, just follow the drawing in Figure 5.

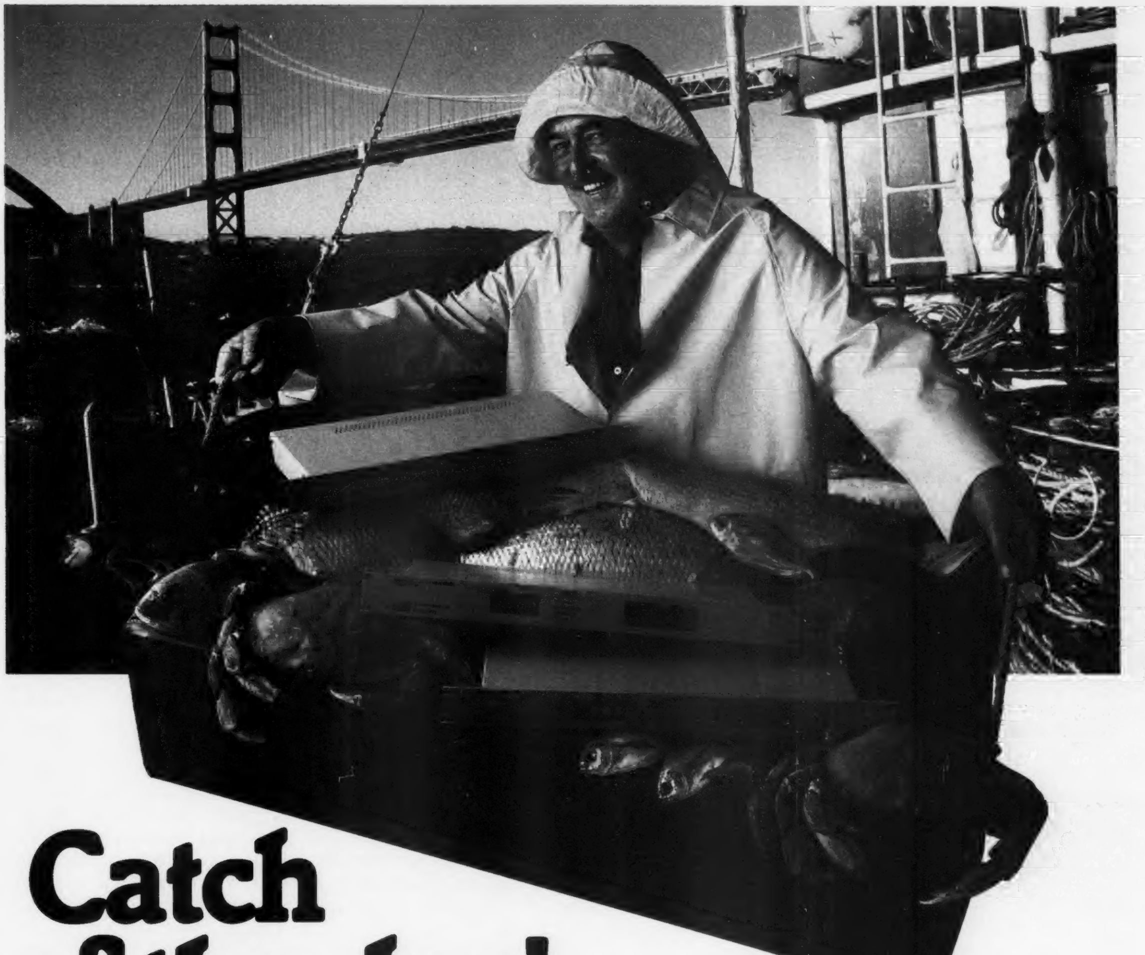
J1, the crystal socket, S1, and the neon lamp, all mount to the front panel. The neon lamp is placed in the middle of a chassis mount rubber grommet with one lead going to the circuit board, and the other to circuit ground under the grommet's lip. The tuning capacitor and circuit board are mounted to the chassis' bottom, and the two remaining jacks are located on the back lip.

Making Waves

Connect power, a dummy load, a crystal, and close the key. Start with C8 at maximum capacitance and rotate clockwise until V2 lights. Tune a receiver to your crystal's frequency, and send a few dits. Slowly rotate C8 clockwise until a clean, chirp-free tone is heard. With R9 set at its maximum resistance, the B+ voltage will be at its minimum with an RF power output slightly under one watt and at its minimum resistance the B+ will be at its maximum with an output of over one watt. If Murphy didn't make an untimely visit to your shack, you should now be ready to make waves.

Continued on page 46

Charles D. Rakes KI5AZ, P.O. Box 445, Bentonville AR 72712.



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Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and is shipped fresh daily. Why not set passage for the abundant waters of Communications Specialists and cast your nets for a TP-38 or other fine catch.

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CIRCLE 10 ON READER SERVICE CARD

A Remote Field Strength Meter

An accurate system for measuring radiated power.

by Ken Cornell W2IMB

Are you sure that you are obtaining the best radiating power from your antenna? Most radio hams rely on their antenna tuning units and SWR bridge, as well as on-the-air reports. Yet there's always the feeling that it could be improved.

Most hams are familiar with the field strength meter. The meter usually consists of a tuned L/C circuit with a whip antenna, and uses a diode to register the relative field strength of the received signal on a sensitive microammeter.

FSMs are valuable for tuning up transmitters, but to accurately measure the relative strength of a transmitted signal, the FSM should not be used inside the shack, close to the transmitter and antenna tuning unit. Instead, it should be used several wavelengths distant from the transmitter's antenna.

This can create a problem, as two people would be required, one at the transmitter site and the other at the remote field strength meter location. Plus, the two parties would need to be able to communicate with each other.

The Remote FSM

The scheme I am about to describe would require only one person. A remote field strength meter is used to send a signal back to the transmitter site. The FSM is capable of indicating maximum radiated power as the transmitter and antenna tuning units are adjusted.

The remote FSM works with an FCC Part 15 transmitter (no license requirements) that operates in the 510 to 1705 kHz spectrum. The FCC rules permit maximum input power of 100 mW and an antenna 2 meters long. At 300 to 400 feet, the transmitter should put a good signal into a station receiver.

See Figure 1 for a block diagram of the system.

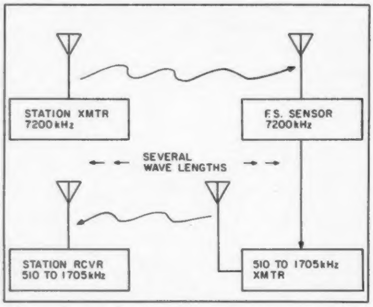

Figure 1. Block diagram of the remote field strength meter.

Figure 2, the FCC Part 15 transmitter, consists of a Hartley VFO with a buffer and final amplifier. I built the circuit on a 2-1/2" x 5" piece of perfboard that in turn was mounted on a block of wood on standoffs. My transmitters include the 1500 to 2000 kHz range, so I used a target frequency of 1650 kHz for the FSM transmitter.

I wound L1 on a 5/16" diameter slug tuned form with 100 turns of #28 enameled wire, with the source tap at 25 turns from the ground end. Coils L2 and L3 were wound on a length of hardwood dowel 1/2" in diameter, each with 100 turns of #28 wire. For L4, I wrapped a turn of Mylar tape around the ground end of L2, and wound 15 turns of #28 wire with taps at 5 and 10 turns. I use the tap that offers best performance.

The varactor (V) is placed across L1 in series with the 0.1 µF blocking capacitor. The F.S. sensor, shown in Figure 2, receives the transmitted signal and rectifies it and the rectified voltage is applied to the varactor circuit through the RF choke.

With no applied voltage, the varactor offers maximum capacity to the tuned circuit. As voltage is applied, the capacity will diminish. Therefore, when used in a VFO tuned circuit, the higher the applied voltage, the higher the frequency.

The F.S. Sensor's transmitted signal is tuned in on the station's receiver, and as the station's transmitter is tuned up to its antenna, the F.S. Sensor will detect this transmitted power; and as the resultant voltage is applied to the F.S. Sensor's transmitter, the frequency will rise. This beat-note will be detected on the station receiver, and the tune-up procedure is continued for maximum beat-note swing. This beat-note swing can be either way, depending on which sideband is used.

This could be an effective way for tuning up a beam antenna. A portable transistor radio can be used, and the F.S. Sensor's transmitter can be tuned to heterodyne a B.C. station, then tune the beam for maximum frequency swing.

Continued on page 46

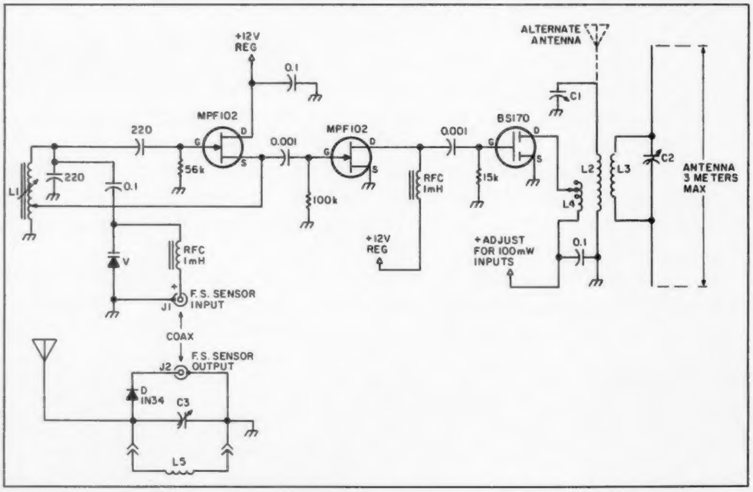

Figure 2. Schematic diagram of the remote field strength sensor and transmitter.

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HT'S

MODEL	DESCRIPTION	LIST	OURS
TH-225A	2M 5W SCANNG DEL	399.95	CALL
TH-27A	2M 2-5W MICRO 40ME	419.95	CALL
TH-47A	70CM 2-5W MICRO	429.95	CALL
TH-415	70CM 2W SCANNG DEL	419.95	CALL
TH-77A	2M/70CM DEL DUAL B	599.95	CALL

MOBILE VHF/UHF

MODEL	DESCRIPTION	LIST	OURS
TM-241A	2M 45W PROG MIC	469.95	CALL
TM-331A	220MHZ 25W PROG MIC	469.95	CALL
TM-441A	440MHZ 25W PROG MIC	479.95	CALL
TM-741A	2M/70CM/? TRIBANDER	849.95	CALL
TM-751A	2M 25W ALL-MODE	699.95	CALL
TS-711A	2M 25W ALLMODE BASE	1059.95	CALL
TS-790A	2M/70CM SATELLITE	1999.95	CALL

HF EQUIPMENT

MODEL	DESCRIPTION	LIST	OURS
TS-140S	HF COMP GEN COV	949.95	CALL
TS-690S	HF/6M COMP GEN COV	1549.95	CALL
TS-450S	HF DELUXE COMP	1349.95	CALL
TS-450S/AT	HFDEL COMP TUNR	1549.95	CALL
TS-850S	HF 12V DEL DDS	1699.95	CALL
TS-850/AT	HF 12V DEL TUNR	1899.95	CALL
TS-950S	HF BASIC VERSION	3299.95	CALL
TS-950SD	HF THE DX MACHINE!	4399.95	CALL

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ADVANCED ELECTRONIC APPLICATIONS

MODEL	DESCRIPTION	LIST	OURS
ISOLOOP	14–30MHz HF ANTENNA	349.00	CALL
ISOPOLE144	2M BASE VERTICAL	59.00	CALL
MM-3	TRAINER/KEYER	189.00	CALL
PCB-88	IBM COMP. PLUG-IN BRD	179.00	CALL
PK-232MBX	ALL-MODE RTTY, CW	379.00	CALL
PK-88	PACKET TNC 300/1200 BAND	139.00	CALL

ASTRON CORP.

MODEL	DESCRIPTION	LIST	OURS
RM-35M	POWSUP 19" RACK 25, 35AC	318.95	CALL
RM-50M	POWSUP 19" RACK 35, 50AC	354.95	CALL
RS-12A	POWSUP 12V, 9A CONT 12SUR	78.95	CALL
RS-12M	12V, 9 C 12S W METERS	104.95	CALL
RS-12S	POWSUP 12V 7.5 10C SPKR	112.95	CALL
RS-20A	POWSUP 12V, 16 CON 20 SUR	121.95	CALL
RS-20M	POWSUP 12V 16C 20S W MET	144.95	CALL
RS-20S	POWSUP 12V 16, 20C SPKR	138.95	CALL
RS-35A	POWSUP 12V, 25 CON 35 SUR	197.95	CALL
RS-35M	POWSUP 12V, 25C, 35S W MTR	204.95	CALL
RS-50A	POWSUP 12V, 35 CON 50 SUR	285.95	CALL
RS-50M	POWSUP 12V, 35C 50S W MET	314.95	CALL
RS-7A	POWSUP 12V 5A CON 7A SUR	68.95	CALL
VS-20M	16A, 20C MTR VOL/CUR CON	170.95	CALL
VS-35M	POWSUP 12V25C 35S MET VA	238.95	CALL
VS-50M	POWSUP 12V35C 50S MET VA	330.95	CALL

ICOM

HT'S

MODEL	DESCRIPTION	LIST	OURS!
IC-02AT	2M 5W 10MEM DTMF	409.00	CALL
IC-2GAT	2M 7W 15MEM DTMF	429.00	CALL
IC-2SAT	2M 2-5W DEL MICRO	439.00	CALL
IC-2SRA	2M/SCANNER HT	599.00	CALL
IC-24AT	2M/70CM DEL MICRO	499.95	CALL
IC-3SAT	220M 2-5W MICRO	449.00	CALL
IC-4SAT	70CM 2-5W MICRO	449.00	CALL
IC-4SRA	70CM/SCANNER HT	599.00	CALL
IC-4GAT	70CM 7W 15MEM DTMF	449.00	CALL
IC-W2A	2M/70CM DUAL MICRO	629.00	CALL

MOBILE VHF/UHF

MODEL	DESCRIPTION	LIST	OURS!
IC-229A	2M FM, 25W 20MEM	449.00	CALL
IC-229H	2M FM, 45W 20MEM	479.00	CALL
IC-3220A	2M/70CM 25W 40MEM	659.00	CALL
IC-3220H	2M/70CM 45W 40MEM	699.00	CALL
IC-2410	2M/70CM 45W DEL.	TBA	CALL

HF EQUIPMENT

MODEL	DESCRIPTION	LIST	OURS!
IC-725	HF COMPACT GEN COV	949.00	CALL
IC-726	HF/6M COMP GEN COV	1299.00	CALL
IC-735	HF DELUXE COMPACT	1149.00	CALL
IC-751A	HF 12V BASE TXCR	1699.00	CALL
IC-765	HF DELUXE TNR,PS	3149.00	CALL
IC-781	HF DX'ERS DELIGHT	6149.00	CALL

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cushcraft CORPORATION

MODEL	DESCRIPTION
A3S	ANT HF 10/15/20M 3 EL STAI
A3WS	ANT HF 12/17M, 3 EL, 8DB, STAI
A4S	ANT HF TRIBANDER 10/15/20
AP8	ANT HF 80–10 WARC VERTICAL
AR-10	TEN METER RINGO
AR-2/70	2M/70CM BASE VERTICAL
ARX-220B	220 MHz VERTICAL
ARX-2B	VHF 2M VERTICAL
AV3	HF 20/15/10M VERTICAL
AV5	ANT HF 80/40/20/15/10 VERTICAL
R5	HF 20/17/15/12/10 VERTICAL
R7	7, 10, 14, 18, 21, 24, 28M VERTICAL

DAIWA

MODEL	DESCRIPTION	LIST	OURS
CN101	METER 1.8–150 MHz 15/1.5K	100.00	CALL
CN103	140–525 MHz SWR/PWR METER	102.95	CALL
CN410M	3.5–150 MHz SWR/PWR MTR	85.00	CALL
CN460M	140–450 MHz SWR/PWR MTR	85.00	CALL
CN465	METER 140–450 MHz 15/75W	83.50	CALL
CN520	METER 1.8–60 MHz 200/2kW	88.00	CALL
NS660A	METER 1.8–150 MHz 30/3kW	159.50	CALL
NS660PA	METER 1.8–150 MHz 3kW	195.00	CALL
NS663BM	SWR METER BASE UNIT	177.97	CALL
NS663BN	METER 150–525 MHz 300W	187.65	CALL

YAESU

HT'S

MODEL	DESCRIPTION	LIST	OURS
FT-411E	2M 2-5W 50MEM,CTCSS	405.00	CALL
FT-811	70CM 2-5W 50MEM	405.00	CALL
FT-470	2M/70CM 2-5W 50MEM	491.00	CALL
FT-26	2M-5W WITH/DTMS PAGING	349.00	CALL
FT-76	440MHz-5W WITH/DTMS PAGING	359.00	CALL

MOBILE VHF/UHF

MODEL	DESCRIPTION	LIST	OURS
FT-290RII	2M 25W ALL-MODE	610.00	CALL
FT-690RII	6M 10W ALL-MODE	752.00	CALL
FT-736R	2M/70CM 220//1.2 SAT	1922.00	CALL
FT-5200	2M/70CM DUAL BAND	749.00	CALL
FT-6200	70CM/1.2 DUAL BAND	899.00	CALL
FT-2400H	2M 50W,LCD,CTCSS	419.00	CALL
FT-790RII	70CM 25W ALL-MODE	681.00	CALL

HF EQUIPMENT

MODEL	DESCRIPTION	LIST	OURS
FT-747GX	HF LGTWGT MOBILE	889.00	CALL
FT757GXII	HF COMP GEN COV	1089.00	CALL
FT-767GX	HF 2//220//70C TUNR	2299.00	CALL
FT-990	HF 12V DEL TUNR +	2399.00	CALL
FT-1000B	HF BASIC VERSION	3399.00	CALL
FT-1000D	HF QSL CATCHER!!	4399.00	CALL
FT-890AT	HF DEL MOBILE DDS	1529.00	CALL

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HF EQUIPMENT—AMEsRICAN MADE

MODEL	DESCRIPTION	LIST	OURS
OMNI IV	HF 9 BAND TXCVR	2245.00	CALL
PARAGON	HF GEN COV TXCVR	2245.00	CALL

DIAMOND ANTENNA

MODEL	DESCRIPTION	LIST	OURS
NR-770H	2M/70CM 3/5 DB MOB ANT	54.95	CALL
NR-770R	2M/70CM 3/5.5 DB MOB	54.95	CALL
SX-100	100 M 1.8–60M 30/300/3kW	185.00	CALL
SX-1000	1000 M 1.8–160/-1300	275.00	CALL
SX-200	200 M 1.8–200M 5/20/200W	125.00	CALL
SX-400	400 M 140–525M 5/20/200W	145.00	CALL
SX-600	600 M 1.8–60/140–525 200W	215.00	CALL
X-200A	2M/70CM 8.3 H 6/8 DB	159.95	CALL
X-300	2M/70CM 6.5/9 DB	189.95	CALL
X-500A(N)	2M/70 8.3/11.7 DB	309.95	CALL
X-500HNA	HD REPEATER VER X-500	254.95	CALL
X-50A	2M/70CM 5.6'H 4.5/7.2 DB	119.95	CALL
X-700	2M/70CM 24'H 9.3/13 DB	409.95	CALL

KANTRONICS

MODEL	DESCRIPTION	LIST	OURS
DATA ENGINEER	TNC SOFTWARE	49.95	CALL
KAM	CW/RTTY/PACKET/FAX TNC	319.95	CALL
KPC-2	300/1200 BAUD PACKET TNC	169.95	CALL
KPC-2400	300/1200/2400 TNC	279.00	CALL
KPC-4	DUAL PORT VHF PACKET TNC	279.00	CALL

rfconcepts

MODEL	DESCRIPTION	LIST	OURS
2-117	144MHz AMP10WIN 170WOUT	319.00	CALL
2-217	144MHz AMP 2WIN 170WOUT	319.00	CALL
2-23	144MHz AMP 2WIN 30WOUT	133.00	CALL
2-317	144MHz AMP 30WIN 170WOUT	279.00	CALL
2-417	144MHz AMP 45WIN 170WOUT	279.00	CALL
2/70	DUAL 3–30W 2M/5–20W 440	239.00	CALL
2/70G	PREA 3–30W 2M/5–20W 440	289.00	CALL
3-112	220MHz 10WIN 120WOUT	319.00	CALL
3-211	220MHz 2WIN 110WOUT	319.00	CALL
3-22	220MHz AMP 2WIN 20WOUT	129.00	CALL
3-312	220MHz 30WIN 120WOUT	279.00	CALL
4-110	440MHz AMP 10WIN 100WOUT	368.00	CALL
4-310	440MHz AMP 30WIN 100WOUT	341.00	CALL
4-32	440MHz AMP 3WIN 20WOUT	178.00	CALL
RFC-2/70	DUALBAND AMP 5WIN 25WOUT	289.00	CALL

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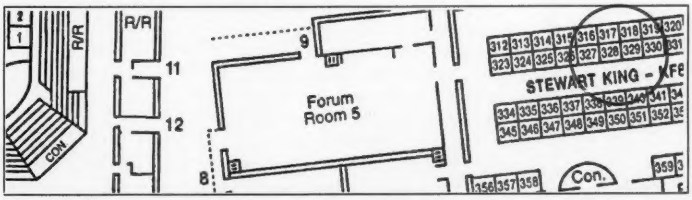

CIRCLE 162 ON READER SERVICE CARD

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One answer to the no-code brou-ha-ha is to make the code so simple to learn that it's a non-problem. Herewith the world's easiest code course—tens of thousands of hams have gotten their licenses this amazing new shortcut way. It's failure-proof. Most people are able to whip through the Novice test after spending less than three hours each on Genesis and The Stickler. People who have given up on other code courses find this one does the job in a jiffy. Going after your General? It's about time. Use the Back Breaker and you'll be there before you know it. A week should do it. Warning, 20wpm code almost invariably appears to cause irreparable, irreversible, permanent brain damage. Uncle Wayne accepts no responsibility whatever for anything that happens to those who are foolish enough to use the Courageous 20wpm tape.

Genesis

5 wpm—This is the beginning tape, taking you through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

The Stickler

6+ wpm—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

Back Breaker

13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so dont get code shy now!

Courageous

20+ wpm—Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the Extra class license. We send the code faster than 20 per.It's like wearing lead weights on your feet when you run; you'll wonder why the examiner is sending so slowly!

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Continued from page 42

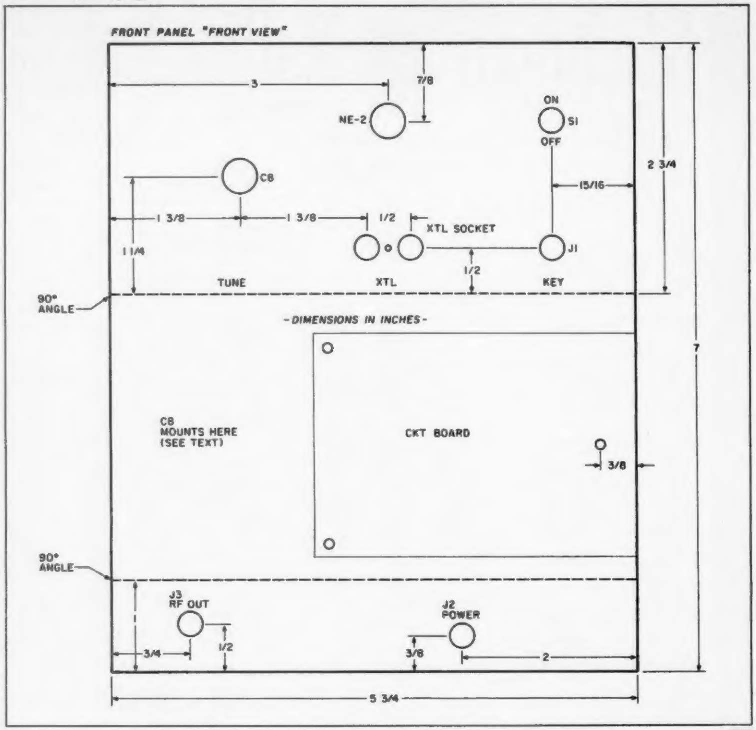

Figure 5. Chassis design and placement of lights and controls.

Field Strength Meter

Continued from page 44

The doublet antenna arrangement I show in Figure 2 is the scheme I use, but an antenna can be connected to the junction of C1 and L2. The FCC rules state that any length of ground return has to be included in the antenna length (three meters).

Any antenna length for the F.S. sensor can be used, and I suggest that the best ground available be used.

For convenience the two units (the sensor and transmitter) do not have to be closely associated, and the units can be separated as desired yet be connected with coax cable via the jacks J1 and J2.

For power, I use two 6 volt lantern batteries connected in series with 12 volts applied to the VFO and buffer. Six volts is taken off for the final amplifier.

I obtained my varactors from DC Electronics, P.O. Box 3203, Scottdale AZ 85271. I ordered a supply of various types, and the MMV2109 is the one I happened to use.

The BS170 (Amperex) and the BS170P (Zetex), both MOSFETs, are fine performers. They are available from Digi-Key Corp., P.O. Box 677, Thief River Falls MN 56701. The BS170 is on page 57, and the BS170P on page 58, in their July–August '91 catalog.

Parts List

Q1,Q2	MPF102 FET
Q3	BS170 MOSFET
L1–L4	See text
L5	See Table 1
C1,C2	90 to 420 pF mica trimmers (RS# 272-1336)
C3	150 pF variable capacitor
C4,C5	220 pF
C6,C7,C10	0.1 μF
C8,C9	0.001 μF
R1	56k resistor
R2	100k
R3	15k
D1	MV2109 varactor diode or equivalent
D2	1N34A germanium diode

Table 1.Field Strength Coil Details

Band	Turns
160m	120 turns closewound
80m	50 turns closewound
40m	20 turns closewound
20m	10 turns spaced one wire diameter apart
10 & 15m	6 turns spaced over a ½ inch length

Use #30 enameled wire.

Ken Cornell (ARS W2IMB), 225 Baltimore Avenue, Point Pleasant Beach NJ 08742.

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Microwave—A Black Box Technology

How is microwave activity doing in your part of the country? Having trouble getting other amateurs out of the woodwork and interested in microwave communications? Is microwave limited to line-of-sight (LOS) communications? What benefits do microwave communications offer? And the big question: Why do we enjoy microwave operations? These and other questions always come up when talking to other amateurs who are trying to understand what we do. I thought I would take time to reflect on just what promotes interest in microwave communications.

Trying to answer these questions and keep on track requires a little tightrope walking. Most communications are portable, not hamshack to hamshack. While there are stations that communicate from home QTH via microwave on a scheduled basis, this is not the norm. Microwave communications is carried out on a prearranged schedule or during the ARRL 10 GHz contest weekends.

Time in the shack is mostly spent in constructing new devices, making improvements to an existing transverter, or experimenting. Most of the items needed have to be constructed, as ready-to-use items are just not available at modest prices. Needless to say, the construction phase is what interests me the most.

Getting Others Involved

Now, how do you interest other amateurs in microwave communications? A few of us were successful in cultivating interest by setting up a working microwave demonstration at our local swap meet. This demo proved to be the catalyst that started the San Diego Microwave Group. We formed a varied interest forum to discuss applications and share ideas. Getting others interested in microwave could be just as simple in your part of the country. Try setting up a station at your local swap meet or hamfest. This usually brings out lots of interested parties. Be prepared for questions. Keep your presentation basic, like a wideband FM link.

The Benefits

What benefits can be derived from microwave communications? If you don't have the pioneer spirit driving you to something new, you might as well use the telephone. It's a lot easier. I catch it from my wife on this one; with excellent results on 2 meters, why do we shift to microwave and all its troubles? Well, if you want to try something new, are interested in construction and outdoor activities, and not just "lunch box operation," microwave has a lot to offer. The new construction techniques increase your knowledge of electronics. Instead of operating someone else's equipment, try building your own. Your radio might not look as good as a commercial unit (mine never did), but you will have lots of fun constructing it. The personal enjoyment I get from home-brewing projects always make me feel quite rewarded.

Answering questions from readers makes me dig deeper into the subject matter, and teaches me new things. It expands my general knowledge, provides me with ideas to develop, and challenges me to improve operations. It's like a game of chess with myself. Now don't take me for anything but a tinkerer and experimenter, one who is glad to share the information gleaned from varied subjects. The deeper I dig for information, and the more ways I find to remove the "black magic" cloak of microwave operations, is reward enough for me.

The Myth of LOS

It is commonly believed that microwave is limited to line of sight communications. Nothing can be farther from the truth! In fact, microwave communications can be regularly carried out on nonlinear paths. Many more contacts occur through scatter and tropospheric ducting than LOS paths. Contacts of several hundred miles and further are standard. Contacts have been made via moonbounce on all the microwave bands up to 10 GHz—that's line of sight, but what I want to point out is that short distance (LOS) is not the limiting factor for microwave communications.

No Comparison

Comparing microwave to VHF operation in my mind is not valid. Today's radios are computerized, with many intricate features. You just don't pick up one of these radios and operate it; you must read the manual first. Personally, I like what VHF operation has evolved into, and I enjoy operating the high tech radios. What is missing for me is that old back-to-basics construction program that promotes interest through application of building techniques. A direct benefit of microwave operation is the knowledge gained through the effort of construction.

On our lower frequencies, such as 3/4 meters (450 MHz), video and SSB weak signal work is quite exciting. Several manufacturers have quite a line of video equipment to operate on these bands. Equipment such as Tom W6ORG's PC Electronics line of video transmitters and receivers help fill a gap in equipment availability for these frequencies. This is just one of many aspects of microwave operation for the 450 and 1296 MHz frequencies. Weak signal SSB/CW work is being carried out on the same bands, and impressive distances have been recorded for DX contacts.

On the frequencies of 2304 MHz and up, SSB and CW contacts have been accomplished from Hawaii to the California coast. This is not the only long distance work that was done, but it's representative of distances covered on one such contact. Many other amateurs have confirmed impressive long-haul contacts. Such contacts necessitate a shift from wideband FM to narrow band operation, usually SSB or CW.

Microwave Narrow Band Operation

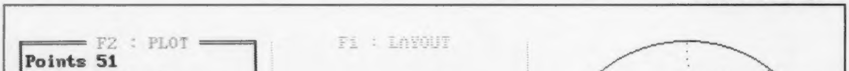
There is much to gain in signal-to-noise ratio advantage by a reduction of bandwidth. This one fact has led a change to SSB for microwave communications. SSB microwave equipment is more costly but far more efficient than WBFM. The frequency stability problem is all but eliminated when using the phase-locked brick oscillators for SSB or CW. For instance, in the last ARRL 10 GHz contest, all 39 contacts made by my station were SSB. I do not plan to abandon WBFM, but rather advance to a different mode of operation.

With the shift to SSB and narrow band operation, the establishment of microwave communication from home QTHs is more likely. With these improved methods, narrow bandwidths, and higher transmitter powers available from both solid state and TWT type amplifiers (available in surplus), home microwave operation is now possible.

Scatter

One example is the station that I currently have on 10 GHz, which can be operated from my home QTH. No, I don't crawl up on the roof for contacts, but rather have an unobtrusive two-foot dish with a flexible and strong

Continued on page 82



```
F2 : PLOT
Points 51
Smith radius 1
    f    9.0000  GHz
□ S21    0.01dB-142.1°

    F3
a lumped 100Ω
b tline 50Ω 17°
c qline 50Ω 65°
d tline 50Ω 29°
e qline 50Ω 67°
f qline 50Ω 90°
g tline 100Ω 75°
h device N45 2mm
i tline 100Ω 90°

F4 : BOARD
zd    50.000  Ω
fd    10.300 GHz
er     2.500
h      0.711 mm
s     25.400 mm
c     10.000 mm
Tab   microstrip
```

Figure 1. PUFF screen dump of file NE4583D. Smith chart, top right. Frequency vs. gain plot, bottom right. Components used in layout window all stripline. Example F = 50 ohm stripline (90 degrees), 1/4-wavelength long.

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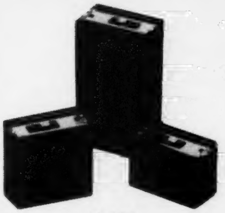

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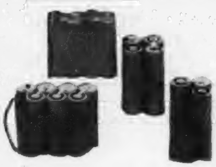

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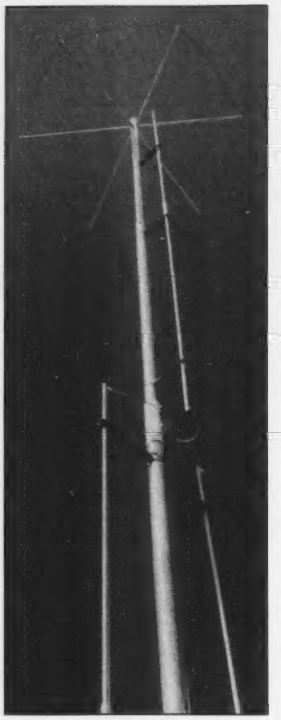

GAP Antenna Products has introduced the Voyager DX-IV, a unique multiband vertical antenna that uses the same GAP technology found in the Challenger DX-VI. The Voyager DX-IV is the first vertical designed primarily for low-band operation. It covers all of 20m, 40m, and 80m with a VSWR under 2:1; on 160m the bandwidth is 90 kHz under 2:1.

The Voyager is 45′ tall with an 80″ diameter capacity hat at the top, giving the antenna an effective electrical height of 66′. The antenna comes with a hinged base which simplifies installation. It requires two sets of guys which are attached to furnished guy clamps. The only other item required for operation is three 57′ counterpoise wires attached at the base of the antenna. These can be displayed in any fashion, which lends itself nicely to tight locations. The Voyager DX-IV weighs a manageable 30 pounds and can be assembled in an afternoon.

The antenna is available through the manufacturer for $389. For more information, contact *GAP Antenna Products Inc., 6010 Bldg. B, North Old Dixie Hwy., Vero Beach FL 32967; (407) 778-3728.* Or circle Reader Service No. 201.

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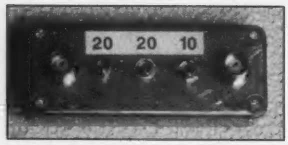
ELECTRON PROCESSING

Electron Processing has announced a new tool for everyone involved in the fun of transmitter hunting, the SGR-1 attenuator box, which reduces the signal received to a meterable level. This handy device lets you make accurate signal comparisons of strong signals and is also a simple tool to aid in receiver alignment. The SGR-1 is a three-section 50 ohm attentuator box that allows you to switch in or out up to 50 dB of attenuation in 10 dB increments. It features easy operation via three toggle switches. Compact and ruggedly constructed, it is ideal for hunting down interference sources. Connection is easy via the two female BNC connectors provided.



The SGR-1 is priced at $50, plus a $5 shipping/handling charge. Contact *Electron Processing, Inc., P.O. Box 68, Cedar MI 49621; (616) 228-7020.* Or circle Reader Service No. 205.

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Procomm, in conjunction with Brainstorm Engineering, has introduced the smallest frequency counter capable of measuring frequencies in excess of 1.3 GHz. The FC-1300 Micro Frequency counter has 0.2 μV sensitivity, 1 kHz resolution, and 0.01 PPM accuracy. The entire unit (3.25″ x 2.13″ x 1.13″) fits easily into a shirt pocket. The FC-1300 is ideal for verifying VFOs, netting crystals on frequency, determining the frequency of unknown transmission, and overall bench applications.

The introductory price is $69.99, battery included. For more information, contact *Procomm, 1948 Coventry Ct., Thousand Oaks CA 91362, (805) 497-2397; or Brainstorm Engineering, 2948½ Honolulu Ave., La Crescenta CA 91214, (818) 249-4383.* Or circle Reader Service No. 202.

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R.L.S., Relational Logging System, is a professional all-band, all-mode QSO logging and reporting system for PC-compatible computers. Its features include extensive QSO data capture, advanced QSLing capabilities (cards, labels and more), on-line ham directory and a powerful reporting system. R.L.S. runs on 286 or higher PCs with 1 meg of RAM and a hard disk. It is backed by a full user support program.

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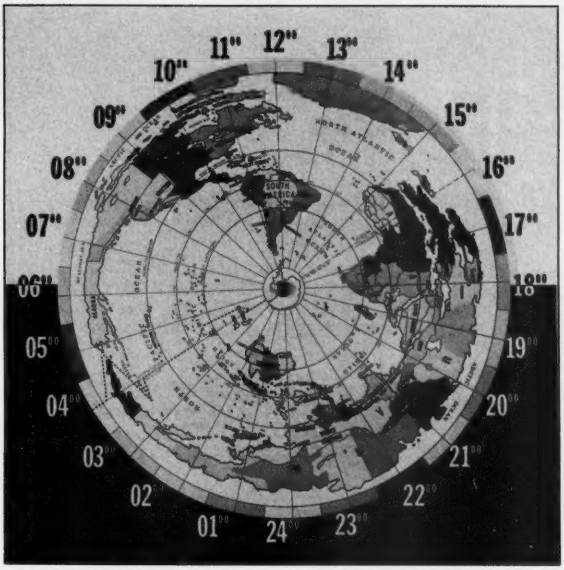
For prices and more information, contact *Gordon West Radio School, 2414 College Dr., Costa Mesa CA 92626; (714) 549-5000.* Or circle Reader Service No. 207.



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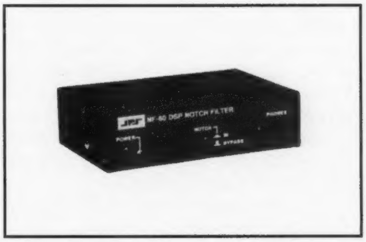

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The Lappack

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by Brian Kassel W5VBO

The successful launch and orbiting of the Microsat series of satellites earlier this year ushered in an exciting new adjunct to the packet radio revolution. With their low orbits and powerful transmitters, the new birds can be worked with a comparatively simple station layout.

This realization led me to begin designing a portable Microsat station. The dream of uploading and downloading messages and bulletins from around the world while camping, vacationing or traveling intrigued me, and so did the possibility of having a nice compact home station for general land-based packet. The emergency preparedness aspect was equally appealing.

Since the downlinks are in the 435 to 437 MHz frequencies, and the uplink on 145 MHz, I needed portable equipment to provide that capability. After attending several hamfests, I was able to find a Yaesu FT-490R and an FT-290R, both multimode portable radios that covered the bands in question. Each unit can be powered either from an optional internal "C" sized NiCd or from external 12 volt sources. I also picked up a used MFJ-1270-B TNC very reasonably. It, too, needs a 12 volt power source. I made the simple modifications to the unit to allow the use of an external PSK modem, as required by the birds. I couldn't locate a used PSK modem, so I bought a new PacComm PSK-1, also requiring a 12 volt power source, just like all of the other equipment.

I already had a laptop, so I was now home free except for the power requirement. The laptop, a Sharp MZ-100, needed 9.2 volts DC, not 12 volts as required by all of the other equipment. Of course, I could have used the Sharp's internal battery, but that would only give four to five hours of operation. In addition to the Microsat operation, I wanted to be able to use the portable station for satellite tracking, terrestrial packet modes, propagation predictions, logging, and so on. With my camping trips always lasting a minimum of two days, not to mention the emergency angle, the laptop power requirement became the weak link to my portable Microsat station.

Photo A. Extended portable laptop operation using the Lappack power interface.

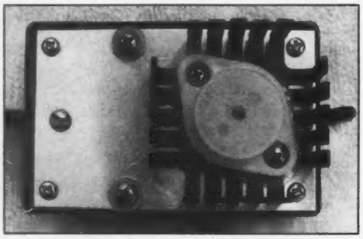

Photo B. Top view of the Lappack.

With all of this in mind, I set out to design and build a power converter which would allow 12 volt operation with the Sharp MZ-100. The first step was to ascertain the actual power requirements. Taking a look at the listed rating of the supplied AC power pack revealed that the unit supplied 9 volts at up to 2.5 amps.

I soon came up with some additional desirable features as goals:

1. Crowbar over-voltage protection.
2. A unit as physically small as home construction would allow, consistent with the subminiature size of the laptop itself.
3. Ease of construction, with easy-to-find parts. (Most parts can be obtained from Radio Shack, and D.C. Electronics can provide all the components. See the Parts List.)
4. Ability to charge the internal laptop lead acid battery, whether the machine is on or off.
5. Overall cost under $25.

After several days of experimentation, I developed the circuit shown in Figure 1.

Circuit Operation

This explanation is designed to be as basic as possible. It is intended for any newcomers crossing over from the software-oriented world of computer hacking into the world of hardware home-brewing.

Circuit operation is best explained by tracing the circuit from the left, or 12 volt input side, to the right, or 9 volt output side. The 12 volt power is brought into the unit via a pair of stranded wires of about 16 gauge, through the in-line fuse holder, the on/off switch S1, and then through D1, which provides polarity reversal protection. If the plus and minus terminals are accidentally reversed, nothing will happen as the diode only conducts in one direction. Disregarding the SCR for the moment, we reach C1, whose purpose is to smooth out any transients or short-term voltage fluctuations that might be caused by several factors, including high power equipment such as transceivers. Anything from 100 µF up to 1000 µF will work here.

Note that R1 is one-third the resistance value of R3. This means that all current through the circuit will be divided so that three times as much current will pass through Q1 as U1. Since our current requirement is 2.5 amps, and since the LM317T can only handle about 1 amp, this trick, also called a wrap-around circuit, allows Q1 to regulate the excess current. Note that U1 is still in the base-collector circuit of Q1, the pass transistor, so Q1's output is a direct representation of the regulator's output. This means that both the voltage regulation and the current limiting characteristics of the chip are directly transferred to the pass transistor, Q1.

D2 ensures that the inherent 0.6 volt voltage drop of Q1 is cancelled out. In other words, the voltage at Q1's collector will be identical to the voltage presented to the input of U1. R2 serves to ensure proper biasing of Q1. D3 prevents potential U1 failure if for some reason the output terminal voltage rises above the IC's input voltage. This situation

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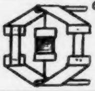

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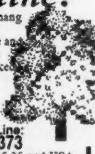

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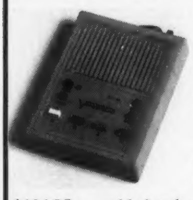

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Item	Description	RS Part No.	D.C. Part No.
Fuse	4A	270-1277	
Fuse holder	270-1281		
D1,2,3	Diode 3A/100 PIV	276-1143	1N5401
S1	SPDT Switch	275-613	SW104
SCR	SCR 6A @ 200 PIV	276-1067	
C1	100 µF @ 25 VDC	272-1016	CEM25-0100
C2	0.1 µF @ 25 VDC	272-1432	21ET100
C3	1.0 µF @ 25 VDC	272-1434	18EM510
R1	0.1Ω @ 5W res.		28PR005-.1
R2	10Ω @ 5W res.		28PR005-10
R3	0.3Ω @ 5W res.		28PR005-.15
R4	200Ω @ 5W res.		28PR005-100
R5	(See text) @ ¼W	271-XXX	
R6	10Ω @ ¼W	271-001	CF25-10
R7	1KΩ @ ¼W	271-023	CF25-1K
R8	100Ω @ ¼W	271-012	CF25-100
D4	Zener 8.2V @ 1W		1N4738
Q1	Transistor MJ2955	276-2043	MJ2955T
U1	IC LM317T	276-1778	LM317T
	Heatsink for Q1 TO-220 only	276-1363	33HS223
	Heatsink for Q1 TO-3 only		33HS306
	Mounting Kit, Q1 TO-220 only	276-1373	4724-TO220
	Mounting Kit, Q1 TO-3 only	276-1371	4725-TO3
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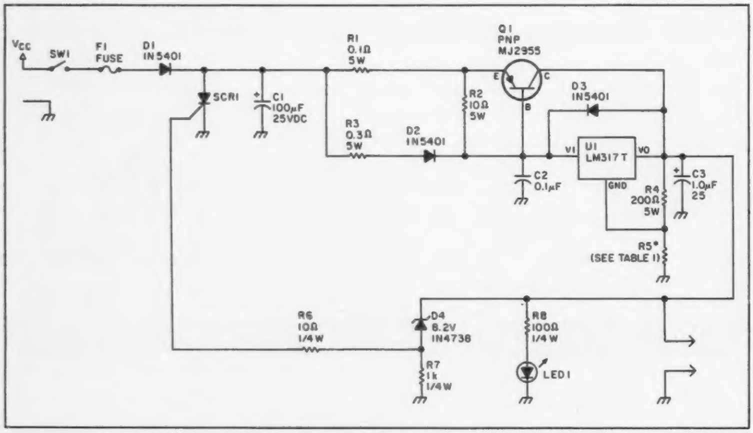

Figure 1. Schematic of the Lappack.

may never happen, but for a few cents, D3 is cheap insurance indeed.

C2's purpose is to suppress any tendency for U1 to oscillate. C3 is chosen to improve something called the transient response of the regulator. This simply means the ability of the regulator to respond to quick changes in load current. The combination of R4 and R5 forms a voltage divider that sets the output voltage of the unit. If your laptop requires a different voltage, just choose the correct resistor for that voltage, as listed in Table 1. Any value less than about 11 volts should work.

Keep in mind that the regulator needs about 3 volts above that of the input voltage in order to maintain proper regulation. D4 is a zener diode whose voltage is chosen to be slightly less than the voltage at which the crowbar shutdown portion of the circuit is to operate. If for any reason the output voltage of the Lappack exceeds the crowbar voltage, the zener conducts. This applies a turn-on voltage of more than 0.6 volts to the gate of the SCR, turning it on. The SCR will almost instantaneously short the input of the unit to ground, blowing the fuse. R8 in combination with the LED provides a simple on/off indicator.

Construction Notes

It is important to note that the SCR, Q1 and U1 are all insulated from the metal portion of the cabinet. Therefore, the Parts List includes information on mounting kits that contain insulated hardware. The photograph of the completed unit illustrates, to some degree, the technique.

There are two different types of packages available for both Q1 and U1, the TO-3 and TO-220 types. The TO-3 is the older of the two, and is the type that is used on Q1 in my unit. The TO-220 type is sometimes referred to as the tab type of mount and is the type that is used in the U1 device in my unit. Make sure that you obtain the correct kit for your particular device(s).

When mounting each of the active devices, ensure that plenty of heatsink compound is liberally applied to the surface that will contact the heatsink.

Be aware that the output jacks required by various devices can be very confusing. Many different coaxial types exist. The center pin diameter, sleeve clearance, and polarity deviate widely. You almost need a micrometer to measure the differences. Radio Shack stores quite often stock a reasonably varied inventory of these plugs.

In my unit, with D4 rated at 8.2 volts, the circuit tripped out at 9.6 volts, with the normal voltage output set to 9.2 volts. Some zener diodes have a turn-on curve that may be significantly sharper than others. This tendency can alter the point of over-voltage trip out several tenths of a volt. Since the zener costs just a few cents, you may want to buy a few diodes that are rated above and below the desired voltage.

Bear in mind that the Lappack is a constant-voltage, and not a constant-current device. It is suitable for charging lead acid type storage batteries, not NiCd types.

The Perfect Companion

This little device has more than doubled my hilltop operating pleasure. Along with a small gell cell, a 2 meter 25 watt power

Continued on page 60

R5 Resistor Value	Voltage Out
750K	5V
910K	6V
1.2K	8V
1.5K	9V
1.8K	10V
2.0K	12V
2.7K	15V
3.3K	18V
3.6K	20V
4.3K	24V

Note: Any output voltage value greater than 10V requires a higher input voltage than 13.6V. In addition capacitor working voltage ratings will have to be increased accordingly. Allow a minimum of 2.5 times the voltage expected to appear across the capacitor as a standard for the working voltage.

Table 1. Resistor value/voltage matchup.

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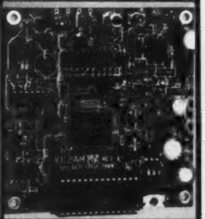

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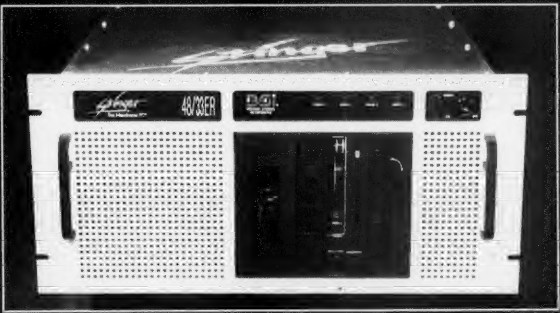

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Every year ATVers across Southern California join forces with members of the Tournament of Roses Radio Association (TORRA) to help cover the annual Pasadena Tournament of Roses Parade.

Any event that brings in over a million spectators along a 5-1/2-mile route requires a massive support system to make sure things run smoothly. Anything could happen during the parade; the intricate floats can and DO break down, various medical emergencies crop up, and sometimes unruly spectators and even organized protestors impede the progress of the parade. Without proper communications, keeping the parade on track could be a logistical nightmare.

Eyes in the Sky

In order to help out with the communications effort, ATV camera locations were perched on top of several buildings (as well as the main viewing stand) along the parade route. From their rooftop vantage points, they could see just about any part of the parade route by zooming in on the trouble spot. Twenty-four ATVers at nine remote camera locations and mission control took part (see the sidebar). The ATV net control station (Koichi KB6EL) communicated with the remote camera sites via the 145.18 MHz telephone company club repeater.

The Video Relay

In order to send the video back from each site over such a large route, each camera location would transmit on 434 MHz back to the WA6SVT/KI6VK ATV repeater (the Crestline Amateur Television Network repeater was borrowed for the parade) which was centrally located on top of the telephone building. The repeater received the remote camera video on 434 MHz and retransmitted it out on 919.25 MHz. From this central hub repeater, the signal could be received by any of the command centers that needed to observe the parade.

ATV receive sites were located at ATV net control in the command trailer, TORRA command, the media room, public safety and the city of Pasadena Sheriff's Department. In addition, most of the remote camera locations had 919.25 MHz downconverters so that they could watch the other remote cameras coming through the repeater.

If any of the centers needed to see a particular part of the parade, they just

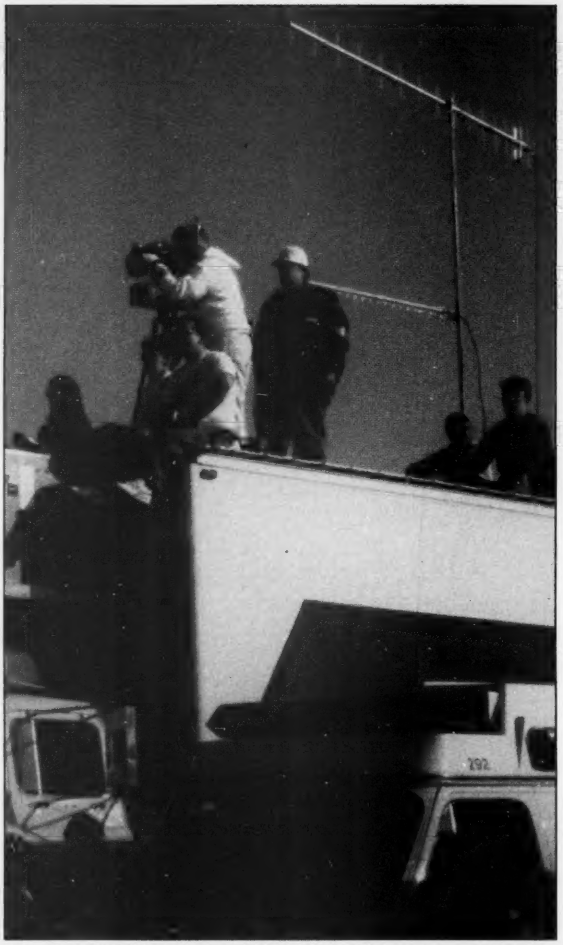

Photo C. Jeff N9CZA mans camera 10 from the roof of the video van at the end of the parade route.

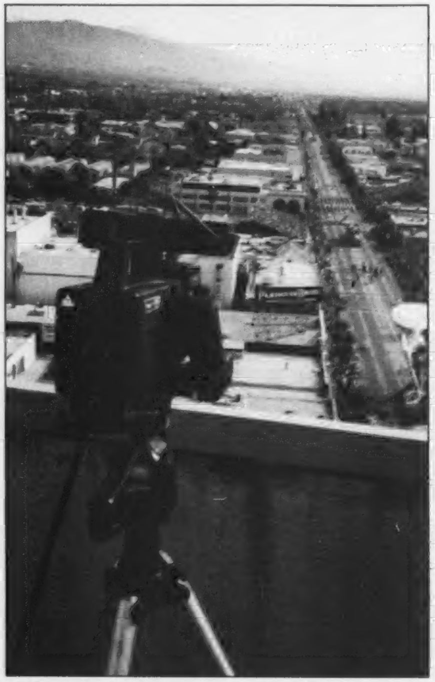

Photo A. The rooftop view from camera 6B allowed the parade command center the capability to observe several miles of the parade route. The Starship Enterprise float can be seen as it progresses down Colorado Boulevard.

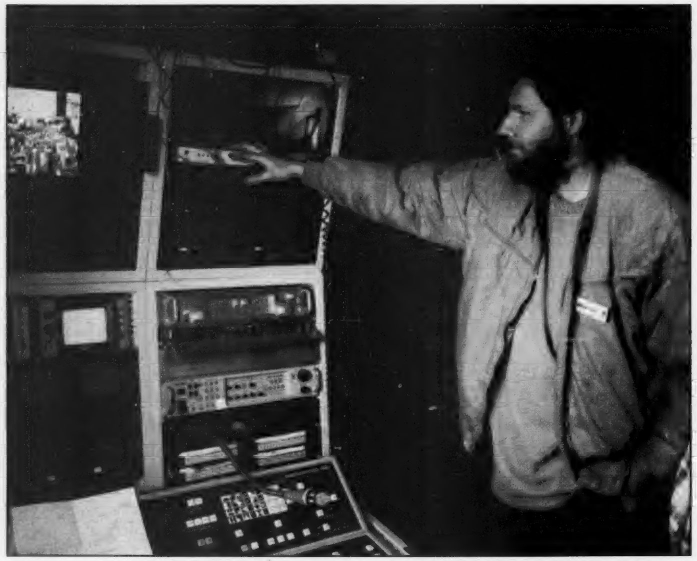

Photo B. Jim KC6TFV demonstrates the inner workings of his mobile video production van (camera 10).

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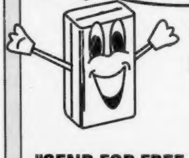

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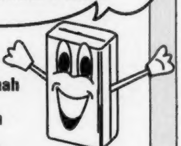

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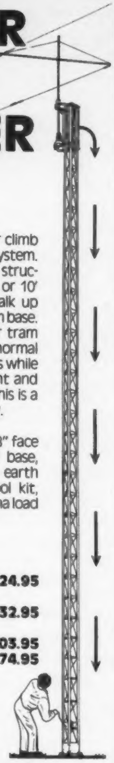

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Camera Positions for the Rose Parade

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Mission control troubleshooters—Mike WA6SVT and Paul N6VLV

Camera 1—Mike KB6IZK and Greg KD6AIS
Camera 2—Eva WA6YQT and John WB6YQT
Camera 3—Greg N6TDZ and Tom KK6YU
Camera 4—Cam KI6VK, Barry KC6OXK and Sue Burke
Camera 5—Doug WB6KNY and Mark Shlosberg
Camera 6A—Bob W6LUY and Robert KB0DC
Camera 6B—Frank K1HHM and Dick WA6BYJ
Camera 7—Jan WB6VRN and David WA6PMX
Camera 8—John KB6MMF and Bud KB6MID
Camera 10—Jim KC6TFV, Jeff N9CZA and Richard N6CIZ

had the ATV net control station ask the nearest camera site to transmit.

ATV In Action

Throughout the course of the parade, each camera crew got their chance to zoom in on a trouble spot. One of the floats veered off course and nudged into the crowd, and some mechanical breakdowns of the floats were observed (a couple needed towing). ATVers even had the opportunity to point out one recurring trouble area. Since the theme of the parade was the 500th anniversary of the discovery of America by Columbus, a number of Native Americans were set up at one spot along the parade route in protest. They even delayed the parade for a short time. Whenever an equestrian group passed, the Indian group would beat on tom-toms, which caused at least one rider to be thrown off his horse. As a result, a contigent of police lined the streets along this portion of the parade to help maintain order.

Several of the rooftop ATV locations had good views of the area, which helped parade officials keep an eye on the disturbance. The ATV effort worked well throughout the parade, and certainly helped parade officials keep track of the parade in an effective way that would not have been easily done through other means.

Helping Out

This kind of activity really helps demonstrate the value of amateur radio to your local community. If your ATV group offers assistance for a public event, or if you use ATV in support of a special activity, I'd like to hear about it. Also, if you've built a video device, circuit or gadget that enhances your ATV station, send me a description or schematic so we can share it with our readers. ■

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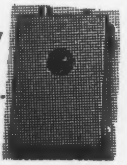

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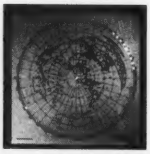

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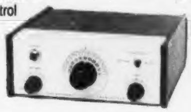

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Continued from page 54

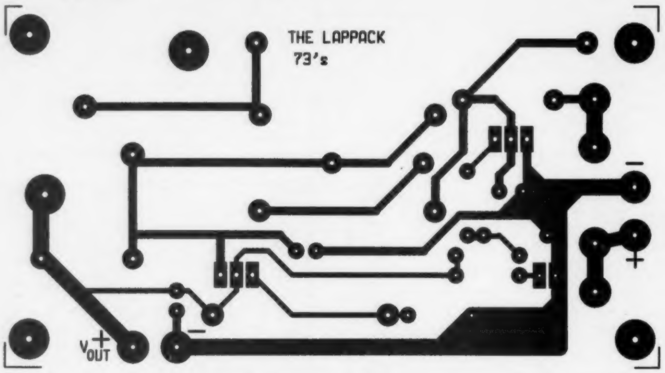

Figure 2. PC board foil pattern.

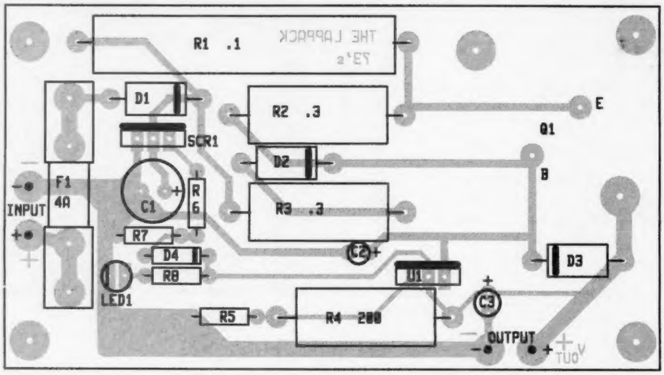

Figure 3. Parts placement.

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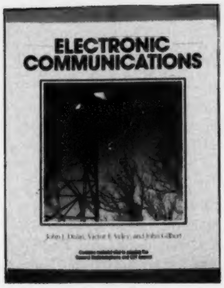
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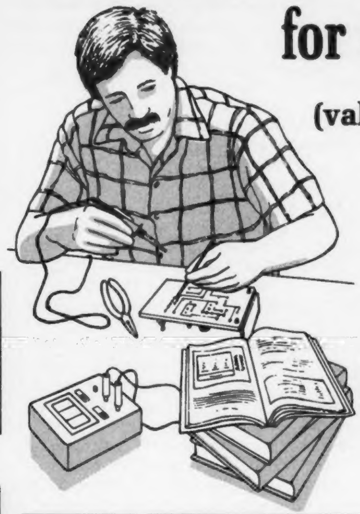

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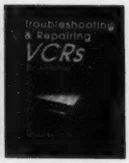
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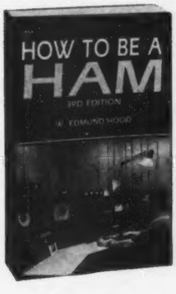
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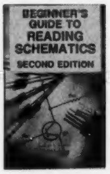
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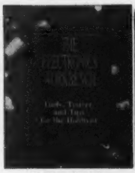

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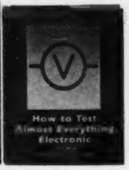
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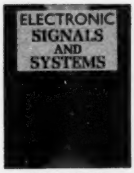
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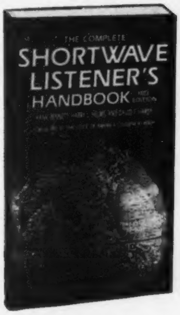
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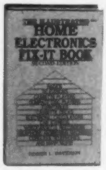
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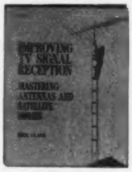
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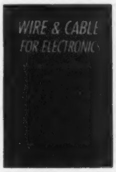
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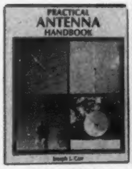
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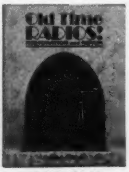
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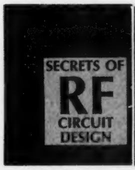
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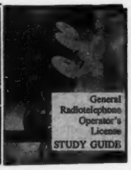
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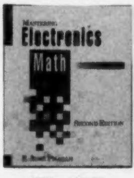
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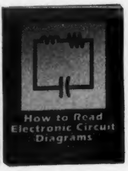
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73 INTERNATIONAL

Arnie Johnson N1BAC
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Notes from FN42

More great events happening in the world, the dissolving of the USSR and the formation of the Commonwealth of Independent States! I have felt very sorry for the citizens in the USSR in the past because of the lack of food in the stores. Even though the prices were kept low by government control so that the citizens could afford the items, that is no good unless there are also goods to purchase, goods that the citizens truly need or want.

The new CIS government has now (as of January 2) increased the prices of goods to what they assume will be an approximate "market economy" price. That is an appropriate first step, BUT the citizens' wages and pensions have not increased by a like amount to match the cost of living. Guess what, sports fans, there are going to be even more hungry people in the CIS because even if more goods become available now that prices have increased (more suppliers willing to sell because of increased profit), fewer people will be able to afford the items because of inflation.

Now, let's look at what is going to happen to the new government economically. The government also needs things which must be acquired by money. They have to either cut back on their purchases to control their spending, or they must come up with more money. I sure hope that they don't do it the way that the USSR government was doing it—by printing more money—because it just won't work. It just makes each ruble worth less. Diluting the value of the currency, things are going to get much worse before they get better!

Enough of Economics 101 and my soapbox. We are very lucky to have a report on Slovenia written by Mate Lenard VE3TJA. If you don't know what or where it is, you haven't been listening very closely to the international news.

We still need YOUR news from YOUR country. We need more Hambassadors. Do your part and either send your country's latest happenings, become a 73 Hambassador, or both. I will be looking forward to hearing from you. Send it by mail directly to me at my address at the beginning of the column, or to 73 via FAX or the 73BBS. Address the electronic mail to "Arnie, 73 International," and I will be sure to get it. 73—Arnie, N1BAC.

Japan

From *The JARL Newsletter:* The 8th General Conference of the International Amateur Radio Union (IARU) Region 3 was held from October 8th through the 12th in Bandung, Indonesia. Eighteen countries or territories of the twenty-four member societies participated in the conference, bringing the total number of participants to exceed 100. When it was reported that Bangladesh and Sri Lanka had sent delegations for the first time, and additionally that Bangladesh had begun the official issuance of amateur radio operator licenses, the conference hall resounded with thunderous applause.

The conference organized four different working groups, in addition to the regular committees for more specialized deliberation on (1) revision of the Constitution, (2) technical matters such as band plans, packet, etc., (3) promotion of amateur radio in developing countries, and (4) ARDF.

At receptions given by the IARU/ARRL, JARL, and ORARI respectively, participants were seen mingling together cultivating new and international friendships, promising to keep each other updated on any new developments. The Conference selected Singapore as the venue for the 9th General Conference, 3 years hence.

All Japan ARDF Competition '91

Surrounded by beautiful autumnal colors, the All Japan ARDF Competition '91 was held on October 20th, under the auspices of JARL, in the "Green Park," a sports leisure land on Asagiri Heights, Fujinomiya City in Shizuoka Prefecture. In addition to about 250 participants who came from all over Japan, there were 12 Chinese and 7 Korean competitors invited to this event. Moreover, 3 participants from the Soviet Union were also in the group.

The ARDF competition is different from the 100 meter running races and anything else. The ranking is not known until the number of discovered transmitters, and the time required for every competitor, has been collected. There are also four classes in the competition: (1) YL: female only, no age restriction; (2) JN class: male, younger than the age of 19; (3) OM class: male, the age of 19 and older but younger than 40; and (4) OT class: male, the age of 40 and older.

In the OM class, JL2JXL, Mr. Yoshiuki Yano discovered five transmitters in 54 minutes 10 seconds, which was quicker than winners of other classes by 30 minutes or more, and was thus considered a brilliant victory. Other class winners were: JN—Mr. Xu Feng of China; OT—Mr. Takayuki Matsuura JH5FUL; and YL—Miss Yoshiko Takahashi.

Slovenia

Report from Mate Lenard VE3TJA: Slovenia will be, in the not too distant future, recognized as a sovereign and independent state. As such, the amateur radio fraternity worldwide will become enriched by this new country and its group of very dedicated amateur radio operators. It may therefore be in order to take an advanced look at what will be in store for the amateur radio community as a whole.

The Republic of Slovenia, which declared its independence on June 25, 1991, is located in the northernmost part of what was until recently Yugoslavia. Geographically speaking, Slovenia borders on Italy, Australia, Hungary, and Croatia. While mainly a mountainous country, there are many beautiful valleys, lakes, and rivers, and the towns and cities are full of historical treasures collected throughout the centuries, some of which extend back as far as Roman times.

There are about 2,000,000 hardworking and well educated Slovenes in Slovenia, and with respect to amateur radio there is one licensed operator for each of 400 inhabitants. This ratio corresponds to those in other developed countries. The first Slovenian hams began to operate around 1930, mainly in Ljubljana, the capital city of Slovenia.

During World War II, many hams went underground, working for the various political factions in their homeland, which had affiliations with Allied governments. After the war, the real upswing began in the later part of the decade when the Slovenian radio amateurs formed their own organization, which of course was an integral part of the Yugoslav Amateur Radio League. This in turn was controlled by the Yugoslav communist government, as was the case in other Eastern European countries. Because of this, and because it was practically impossible to buy transmitting equipment at that time, nearly all activities were conducted in radio clubs. There, the classes were conducted and the equipment was built, or rebuilt, from parts and stations left over by the Italian and German occupation armies, or those parachuted in by the Allied forces during the war. Because of this, large groups of excellent operators emerged.

Slovenian operators represented, until recently, 30% of all operators in the remaining five Yugoslavian Republics. They have participated in national, European, and world contests, and were often rated among the best in the world. In the true ham spirit they were always ready to help when natural disasters struck their country. Just a few months ago, in June and July 1991, when the Yugoslav Army invaded Slovenia, the ham radio operators in slovenia contributed a great deal toward the defeat of the Yugoslav Army by the Slovenian Territorial Defense Forces.

In the spring of 1991, the 19th Conference of the Slovenian Amateur Radio League (Zveza Radioamaterjev Slovenije [ZRS]) was held, a new constitution was accepted, and Board of Directors were elected for the period of 1991—1994. Elected were: President Stipanic Anton YU3BH, Vice-Presidents Blenkus Gojmir YU3AW, Kuselj Janko YU3RW, and Vehovc Joze YU3EJ. The Control Branch and Legal Section consists of experts in their respective fields. For the present, the Slovenian hams are using the old Yugoslavian prefixes YT3, YU3, YZ3, and 4N3 (number 3 being Slovenia). A new prefix depicting the independent Slovenian State is expected to be in force soon.

Out of 4,759 members there are presently 3,324 home-based operators, with the remaining 1,435 hams active in some 88 radio clubs across the country. The ZRS publish a bimonthly "CQ YU3" magazine, which was just renamed to "CQ ZRS." This is a highly technical publication, put together by Slovenian experts of such caliber as Matjaz Vidmar YT3MV, who was a Fulbright Scholarship recipient at the University of Colorado. Mr. Vidmar has in the past designed and built highly efficient transmitters for NASA spacecraft (see *QST*, MAY 1989, p. 39). He has returned to Slovenia because he was "craving for good, homemade Slovenian food and wine." Hi!

Photo A. Left to right: Joe 4X6KJ, IARC Chairman, and Ron Gang 4X1MK, filling out certificates for participants in the Israel 40th Anniversary Contest, worldwide.

Continued on page 64

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Measuring RF Power

Figure 1 illustrates a simple gadget enabling the measurement of RF power dissipated in a 50 ohm dummy load within a few percent. It covers from 10 to 1800 watts in three ranges. It can be calibrated with a variable DC power supply at voltages equivalent to the RF power in watts applied to the dummy load, as modified by the internal circuitry illustrated. The range of RF rms voltages across 50 ohms varies between 22.4 volts at 10 watts to 300 volts at 1800 watts. A voltage divider and a pair of zener diodes reduce this wide voltage range to less than 10 VDC, which is calibrated in watts on three scales.

Table 1 gives the equivalent voltages applied to the meter when the matching power level in watts is applied to the dummy load. The meter, with its series multiplier, is set to measure a full-scale DC voltage of 10 volts.

Figure 2 illustrates the connection of this gadget to the dummy load and transmitter/transceiver RF output. The transmitter/transceiver must be operating on CW when using this gadget.

This gadget must be built in a shielded enclosure and a shield placed internally to prevent any RF leakage into the meter and multiplier area. A T-connector allows connection of this gadget and the transmitter to the dummy load.

J. Frank Brumbaugh KB4ZGC
Buffalo NY

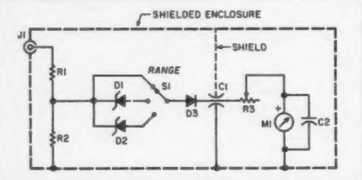

Figure 1. The gadget.

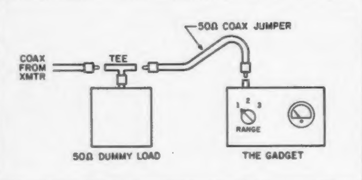

Figure 2. Operation.

Table 1. Calibration

Range 1		Range 2		Range 3	
Watts	**Volts**	**Watts**	**Volts**	**Watts**	**Volts**
10	2.24	300	1.20	900	2.12
25	3.54	400	4.14	1000	2.24
50	5.00	500	5.80	1250	5.00
75	6.12	600	7.32	1500	7.40
100	7.07	700	8.71	1800	10.00
125	7.90	800	10.0		
150	8.70				
200	10.00				

Parts List

R1	9.1k ¼W 5%
R2	910 ohm ¼W 5%
R3	Meter multiplier (see text)
D1	10V zener (1N758; 1N961; 1N5240; 1N5856; 1N6000)
D2	20V zener (1N968; 1N5250; 1N5540; 1N5866; 1N6007)
D3	Germanium diode (1N34A; 1N90; etc.)
C1	Feed-through capacitor, 0.001 to 0.01 µF
C2	0.01 µF disc capacitor
J1	SO-239, or connector to match coaxial cable from transmitter
M1	DC milliammeter, 100 µA to 1 mA
S1	1-pole, 3-position wafer switch

73 INTERNATIONAL

Continued from page 62

The Slovenian Amateur Radio League is striving to widen the ham spirit in their homeland according to the guidelines of the International Amateur Radio Union (IARU), and thus wishes to contribute to an even greater success of this world movement.

For additional information please contact: Zveza Radioamaterjev Slovenije (Slovenian Radio Amateur League), Lepi pot 6, YU-61000 Ljubljana, Slovenija. Tel: (+38-61) 222-459.

[Mate VE3TJA and Tom VE3VKE toured Slovenia, Bosmia-Herzegovina, and Croatia in 1990 and met over 200 hams. If your club is interested in a slide presentation, please contact Mate Lenard, 118 Princefield Rd., Toronto, Ont.Canada M4W 1Z9, or call (416) 925-0359. Mate was asked to write this by his good friend, Joze Snoj YT3ZG.—Arnie]

ISRAEL

Ron Gang 4X1MK
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THE HOLYLAND DX CONTEST
Israel—1992

From Saturday April 18th 1800 UTC through Sunday April 19th 1800 UTC, the Israel Amateur Radio Club is sponsoring a contest open to three categories of participants worldwide: 1. Single Operator, 2. Multi Operator, single transmitter, and 3. SWLs. Both SSB and CW may be used on 160, 80, 40, 20, 15, and 10 metres, according to IARU Region recommendations.

Worldwide stations contact only Israeli stations, and send RS(T) and QSO number, and Israeli stations give RS(T) and area designator. The same station may be worked both on SSB and CW on each of all six bands, but no cross-band or cross-mode contacts are allowed.

The final score is the sum of QSO points (2 points for QSOs on 160, 80, and 40 metres, and 1 point for 20, 15, and 10) multiplied by the number of area designators worked per band. An area designator consists of a letter, two digits, and two more letters—i.e., E14TA or H08HF, the first three figures designating a particular grid square on the map of Israel, and the last two letters the administrative region.

Entries postmarked no later than May 31, 1992, go to: Contest Manager, Israel Amateur Radio Club, Box 4099, 61040, Tel-Aviv, Israel, and must consist of separate logs for each band and mode including time, callsign, RS(T), and QSO number sent, and RS(T) and area received. SWLs log only Israeli stations. Include a summary sheet listing number of points and multipliers per band, and a score calculation as well as a declaration of adherence to contest rules and licence regulations.

A trophy will be awarded for the winner in each category, a plaque for each continental winner, and certificates to the top scorer for each country having made at least 50 QSO points. 73

Number 17 on your Feedback card

UPDATES

The Quag-V—Again

See the above article in the December 1991 issue, page 36. See also last month's update on the boom length for the 146 MHz section, which should be 14 feet (not 12). Now, before you build this antenna, see the Figure. Change the driven element and reflector angle to eliminate a double lobe off the front of the antenna's radiation pattern.

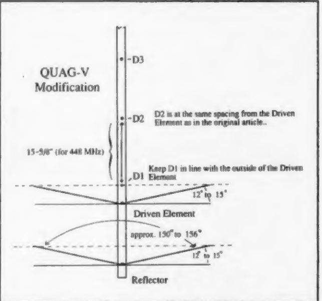
QUAG-V
Modification
D3
D2
D2 is at the same spacing from the Driven Element as in the original article..
15-5/8" (for 448 MHz)
D1
Keep D1 in line with the outside of the Driven Element
12° to 15°
Driven Element
approx. 150° to 156°
12° to 15°
Reflector

Figure. The modified Quag-V antenna.

Function Generator and Surplus Meters

See the two articles above, on pages 28 and 42, respectively, in the January 1992 issue. J. Frank Brumbaugh KB4ZGC writes: "In the 'Function Generator' article on page 28, the second paragraph under 'The Circuit' should read: 'Lowering the frequency *increases* their amplitude; raising the frequency *reduces* their amplitude, providing less gain.'

"In the 'Surplus Meters' article, Figure 2 on page 42, the meter should be a 1 mA meter (or else the dropping resistor should be 200 ohms). In the text on page 45 where Figure 2 is discussed, change '5 mA' to '1 mA' in the fourth paragraph under 'Voltage Multiplier Resistance.' "

Pseudo CW Filter

See the above article in the June 1991 issue, page 18. Chet Garrison W6ZZB writes that the schematic diagram should indicate that pins 4 and 8 of the 555 IC are shorted together. The "dot" indicating the connection is missing from the diagram.

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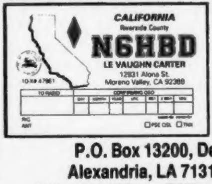

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More Mixing

Last time, we were discussing receiver anatomy. Let's continue.

As I was saying, when you pass two signals through a nonlinear stage, they interfere with each other, or "mix." (Another word for mix is "heterodyne.") This results in a complex composite signal at the stage's output. The mix can be separated into four distinct signals: the original two, plus their sum and their difference frequencies. It is also possible to construct a mixer which outputs only the sum and difference signals, rejecting the original input frequencies. Such a mixer is called "balanced," and is essentially the same circuit as the balanced modulator used in generating sideband signals in a transmitter.

So, why do all this anyway? Well, if one input signal is the one you want to receive (or a jumble of frequencies containing it) and the other is from a local oscillator (in the radio), you can vary the apparent frequency of the received signals by varying the local oscillator's frequency. Example: the signal you want is at 14 MHz. If you mix it with a 5 MHz oscillator, you will get signals at 9 MHz and 19 MHz, because those are the sum and difference frequencies. If you shift the local signal by 1 MHz, the mixer's output signals will shift by the same amount.

By making a tuning dial which controlled the tuned antenna circuit and the local oscillator's frequency at the same time, Armstrong was able to make any given station's signal appear to the receiver's subsequent stages as if the signal were on one predetermined frequency. No matter where you tuned, the local oscillator would track your tuning at the same offset (say, 5 MHz from the tuned frequency), so the mixer's "difference" output *for that tuned frequency* would always be the same as the offset frequency, in this case 5 MHz. Of course, other stations on adjacent frequencies which made it through the tuned circuit in the front end would be mixed to new frequencies adjacent to the offset frequency, too. But at least you could be sure that the signal you wanted was on the offset frequency, no matter what the station's original frequency was.

This brilliant idea gave Armstrong the solution to the Holy Grail of radio: selectivity.

An "I.F.FY" Proposition

Ok, so we've got a band of frequencies, and we know the one we want is on our predetermined frequency of 5 MHz, no matter where it started. So what? Well, now we can feed it to a chain of amplifiers tuned for that frequency, that's what! Such stages are called Intermediate Frequency, or IF, stages, and they are where we get most of our selectivity.

The Immovable Object

The steeper the resonant peak of a circuit, the more selectivity it has, because it passes what's in the peak and rejects what's not. That much seems obvious. However, easily tunable things like coils and caps just don't have enough "Q" (Quality factor, or steepness of resonance) to separate radio stations which are fairly close to each other. Sure, you can cascade several of them into a chain, but how do you tune them all at the same time as you change frequencies? And the really narrow, tight devices have the unfortunate characteristic that you can't tune them; they must be designed for a specific frequency. Examples of such filtering devices are crystals, ceramics and mechanical filters.

But wait a minute, we now have a situation where we are only trying to amplify one frequency, while losing all the others. You guessed it, it's a marriage made in RF heaven.

In Armstrong's early days, things like crystal filters weren't conceivable for home receivers. Heck, I doubt they even existed back then! But a series of LC-tuned amplifiers, all set to the mixer's difference frequency (called the intermediate frequency), worked very well. Not only was there lots and lots of gain which couldn't cause trouble by feeding back into the front end (because it was on a completely different frequency band), but there was much more Q, thus more selectivity, than had ever been dreamed of before! At last, stations could be separated with *no* interference. The battle was won. Or was it?

Images

Well, sort of. As more and more frequency bands began to be used, a new problem arose, even with the amazing superhet design. Remember how that 14 MHz signal mixed with the 9 MHz local oscillator to get the 5 MHz IF? Well, what's to prevent a signal at 4 MHz from mixing with the 9 MHz local and creating another 5 MHz product? Remember, addition and subtraction both produce the same result! At the output of the mixer, such a signal would be indistinguishable from the one you wanted. Unfortunately, it happens, and these false signals are called "images." "Ah," I hear you say, "but the tuned circuit at the beginning should prevent that!"

Playing the Percentages

LC circuits function as a percentage of their total frequency. By that I mean that a tuned circuit's response may fall, say, 6 dB from its peak of resonance in perhaps 5 percent of the frequency it resonates on. Thus, a 10 MHz LC with such a 5 percent characteristic will fall 6 dB when signals 0.5 MHz away from 10 MHz are fed into it. By the same token, a 500 kHz circuit's response will fall the same amount within 25 kHz. That means that the higher the design frequency, the wider the response.

For AM or SSB stations to be received without interference, they must be much more than 6 dB down from one another. Even at 30 dB down, an interfering signal is a nuisance. So, it is important to keep the images as far away as possible from the signals we want, and the way to do that is to make the intermediate frequency as high as possible.

> ***"This brilliant idea gave Armstrong the solution to the Holy Grail of radio: selectivity."***

Contradictions?

"What?" I hear you say. "If the coils get wider as the frequency goes up, why would I want to go up?!" Well, let's look at an example. Let's say we want to receive a station transmitting on 5 MHz. If we use a low IF, perhaps 500 kHz, then the local oscillator will be running at either 4.5 MHz or 5.5 MHz, resulting in the 500 kHz IF at the output of the mixer. (Remember, either one will work because all that matters is the difference frequency between the oscillator and the signal.) For convenience, let's say that the oscillator is running at 4.5 MHz. That means that the image frequency is 4 MHz, because that frequency will also result in a 500 kHz signal when mixed with the 4.5 MHz local oscillator. Heck, that's only 1 MHz from the signal we want, and only 20% of the total frequency of the 5 MHz signal we are trying to receive. It is reasonable to assume that some of that 4 MHz signal will get through the front end's tuned circuit and be heard.

Up, Up and Away

Now let's look at the same situation, but with a high IF. Let's say we mix the incoming 5 MHz signal with a 50 MHz local oscillator, resulting in a 45 MHz IF. The image frequency is now 95 MHz, which is 19 times the frequency of the desired signal! How much 95 MHz signal do you think will make it through a 5 MHz tuned circuit, or even a simple bandpass filter? See, this technique makes the initial tuned circuit tremendously more effective and virtually eliminates images.

Unfortunately, the high intermediate frequency also suggests that the selectivity of the IF stages will be less, due to the same percentage effect. So, we're left with a contradiction: good image response or good selectivity, but not both. Is there a way out?

Once Is Never Enough

Sure. Why not start with a high IF for good image response and then convert its output *again* to a low IF for good selectivity? Let's say we are trying to receive that station on 5 MHz. We mix it with a 50 MHz local oscillator, resulting in signals at 55 and 45 MHz, and with essentially no images. We run them through a few tuned circuits at 45 MHz, then mix them with a 45.5 MHz oscillator. Now we've got signals at 500 kHz and 90.5 MHz, perhaps along with some small ones at 100.5 MHz. The unwanted signals are up in the stratosphere and completely disappear when we feed the mess through our nice, narrow 500 kHz IF stages. What's left is *only* the one we want. At last, we've got truly great selectivity and the image problem is gone.

Such a design is called "double (or dual) conversion," and most modern receivers are made this way. In fact, many good communications receivers and ham transceivers carry the idea to the extreme by employing triple and even quadruple conversion. Remember, once you've done the first conversion, all the signals you want are on one frequency, and you can use fixed local oscillators to do subsequent conversions; only the first local oscillator needs to track the tuning.

Well, there's still more to receiver design. In particular, the topics of gain distribution and dynamic range. Next month, we'll finish it up. Now, let's look at a letter:

Dear Kaboom,

I use a tape recorder to log contacts. I notice that when I transmit on VHF FM, the recorder's speed drags! Also, there's a buzz in the audio when I play it back. Is there any way to fix it?

Signed,
Wobbly

Dear Wobbly,

You are getting RF into the recorder. The speed change suggests to me that your recorder uses a servo circuit to maintain tape speed and it is getting trashed by your signal. The audio buzz is basically the same problem. Most recorders are not shielded very well, if at all, so there's not much you can do except try a different machine or move the RF farther away. Try a cheap recorder; they usually don't have servos. Of course, the audio may still buzz, but at least the buzz will stay at the same pitch!

See you all next month!

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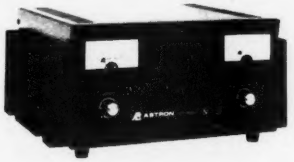

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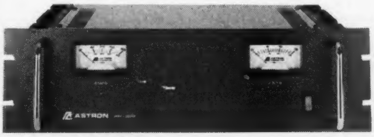
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7

RM SERIES



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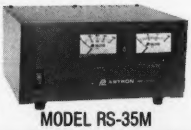
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

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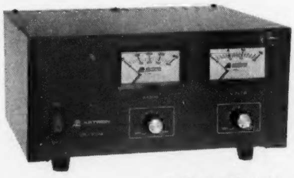

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VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

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Home Sweet School

The rapidly growing movement of home schooling as an alternative to conventional American education has long fascinated me. According to the article "Schooling in Family Values," by Thomas Toch, in the December 9, 1991, issue of *U.S. News & World Report*, the number of students educated at home has swelled from 10,000 in 1970 to over 300,000 today, an increase that shows no sign of slackening. According to this article, about 75 percent of home schoolers are conservative Christians who stress the Bible in their teachings and who lament what they see as a decline in traditional values in the public schools. Others are of the belief that public schools don't set high enough academic standards. But all home schoolers seem to share the belief that education is integral to family life.

Lead by a very aggressive home school lobby, the movement has been successful in getting 34 states to pass measures since 1982 that have eliminated many of the legal barriers and have eased the way for home schooling, primarily by relaxing teacher-training and curriculum requirements.

At its best, home schooling has many of the attributes that school reformers have sought for public schools, including more personal attention and more hands-on learning experiences. "It's handicraft versus mass production," says Roger Creech, a public school teacher who shares the instruction of both his 13-year-old daughter and 12-year-old son with his wife, Kathleen. Studies that

Photo A. Studies have shown that home study students do just as well as their counterparts in public schools. Janet KB5OWF (at right) teaches her daughters (from l to r) Marie KB5OPB, Shalon KB5OMY and Linda KB5PDW. Regular contacts have been made with the CQ All Schools Net on 28.303 MHz.

Photo B. Uncle Bernie instructs the girls in the ham radio class.

have been conducted suggest that home-schooled students do as well or better than their publicly-schooled counterparts on national standardized tests. Anecdotal evidence suggests, perhaps more importantly, that youngsters schooled at home are independent and inquisitive learners.

While it is not my intention to present a case either for or against home schooling in this particular column, I must in all fairness say that there are many educators and sociologists who are quick to point out the negatives of home schooling. Although home-schooling parents are typically better educated and more affluent than the national average, few are qualified to teach their children more advanced courses like calculus and chemistry. Nor can they offer many resources vital to good education which include science labs, foreign language laboratories, athletic equipment, and so on. Critics are also concerned with the lack of opportunity for home-schooled youngsters to interact in group situations like gym, chorus and other socially important activities.

Whatever your thinking may be on this controversial topic, it's important to at least be aware of its existence as a growing phenomenon in American education as an alternative means of teaching young people. It recently became prominent in my thoughts when I had the pleasure of encountering the Giesen family from Houston, Texas, on the CQ All Schools Net.

Janet Giesen KB5OWF is the mother of three terrific teen-aged daughters, all of whom are ham radio operators. Not only are the Giesen children schooled at home, they are also fortunate enough to be getting ham radio instruction included in their curriculum. Is there anyone out there reading this column who can't think of the thousands of possibilities for creative, highly motivational lessons these parents can be using on a daily basis? What a terrific opportunity!

Shalon Ann Giesen KB5OMY is 14 years old. She was the first Giesen family member to contact us on the net. It was really interesting for the children in my 6th, 7th, and 8th grade ham radio classes to learn about home schooling, a subject very few of them knew anything about. Shalon explained that she has many friends in their home-school support group, a group of families that also provide home schooling for their children. They are very friendly as a family with another home-school family on their same street. The Giesen children do get the benefit of specialized instruction by having a band teacher work with them on their music.

Shalon had us all fascinated as she described her typical school day. She runs long distances in the morning since she is training for the marathon. Next, she has Bible study and breakfast with the family. Math is the first subject of the day because Shalon feels her thinking is the clearest then. The rest of the school day doesn't follow the same order. She does music study, vocabulary, science, social studies, art, and spelling. She also has quiet time for prayer or meditation. Unlike in other schools, her school day is over as soon as she has completed her assignments. Shalon is in her fourth year of home instruction and likes the one-on-one attention very much. She also enjoys the ability to be flexible with the school day if something unforeseen comes up.

The girls got interested in ham radio when their Uncle Bernie, who lives with them, announced that his company, Compaq, was giving free lessons. It took Shalon four months to get her license, and she claims that learning the Morse code has helped her in her spelling work.

Linda KB5PDW is also 14 years old. She told me that one of the reasons her family decided to home school was that she was having some difficulty in the fourth grade. The second reason was that since the three sisters were adopted three years ago, it helped to bond them as a family. Linda explained how they have the benefit of being taught about the law by dad, an attorney who works at home. He also coaches the girls on running. Uncle Bernie teaches the girls science and is affectionately referred to as Mr. Science.

Some of the field trips the girls have gone on are: the bakery, ice carving events, the power plant, McDonalds, museums, the sugar factory, the ice cream factory, and Wheels, a charity for those who can't afford groceries.

Ham radio became one of their subjects, Linda told me, because it helped them to improve their spelling and test-taking skills. It also helped the girls improve their listening skills, and it has helped give them confidence in conducting a conversation. She feels that their math and science have also improved as a result of ham radio.

Marie KB5OPB is 12 years old. She is absolutely delightful to speak with on the radio. When Uncle Bernie suggested that they all take advantage of the free ham radio classes being offered by Compaq Computers, he couldn't convince Marie that it wouldn't be boring. He got his license first, and once Marie heard him talking on the radio, she got hooked. Some of her favorite contacts were made with hams in England, Utah; Spring, Texas; and Marshall, Texas. She says that her new favorite is the CQ All Schools Net. Marie looks forward to speaking with the other children at my end in Staten Island, New York. She has become a regular Thursday check-in on our net, and she says she enjoys the chance to exchange news and information with the other youngsters on the net every Thursday at 17:30 UTC on 28.303 MHz.

My students and I look forward to speaking with the Giesen family every Thursday. They are excellent examples of a caring, innovative family deeply concerned about family values and the quality of their children's education. How fortunate for all of us that we can share some of their experiences through ham radio. ■

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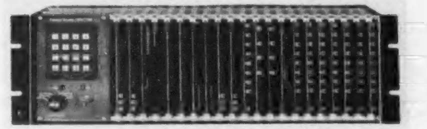

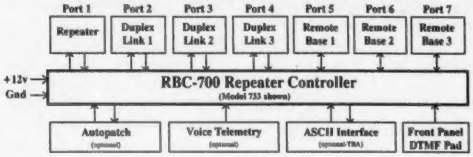

The RBC-700 Repeater Controller is designed to support Repeater systems that require multiple radios connected together at a site. The RBC-700 utilizes a true 7 x 7 audio matrix switch which allows several conversations between ports at the same time. In the illustration above the 733 model is supporting a Repeater, 3 Duplexed Links to different sites, and 3 Remote Bases. Using simple commands, a user could tie the Repeater and a Remote Base to one Link, while the other Links are communicating through your site, holding separate conversations. Or, connect all of the ports together - like a big party line !!

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Radio Direction Finding

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Home-Brewing Hints and Heroic Hunting

I am constantly amazed by the wide interest in radio direction finding (RDF) competitions, which are called transmitter hunts, foxhunts, T-hunts or bunny hunts, depending on where you live. The mail this month included inquiries from all over the USA, plus Canada, Colombia, and Greece.

I love trying out new RDF circuits, but I am too impatient to worry much about mechanical issues when I build prototypes. The equipment works, but often gets beat up quickly. That makes it fail at the worst possible time—in the middle of a hunt. Then I am faced with patching it up. Or I could rebuild it the right way. Nah, there just isn't time. So my 6 meter mobile quad still has wooden dowel spacers that break every so often, and the wiring in my "sniffer" box looks like the web of a brain-damaged spider.

Photogenic Projects

I have a deep appreciation for hams who have the patience and mechanical skills to make gear that works right, looks good, and lasts a long time. One such builder is Dave Pelaez AH2AR, who sent some pictures of his work.

Photo A is Dave's dual-antenna "sniffer" for 440 MHz. He used the plastic handle from a device intended for cleaning paddle fan blades. With a twist of the wrist, it is extendible to allow the antenna to be held high overhead. The whips are 3/32" bronze brazing rod soldered to thick PC board material. Lands for the antenna terminals and other components were etched by the photoresist technique.

For extra ruggedness, Dave potted the electronics in the box with epoxy resin and hardener. "You could crack walnuts with it," he says. Nice work! My only suggestion would be to glue some plastic balls to the whip tips for eye protection.

This technique is fine for the 70cm band, but things get a bit too big at 2 meters. At 144 MHz, it is better to be able to remove the whips for transport and storage. But when you take them apart, you inevitably lose some important piece. That is why a fold-up antenna is even nicer.

AH2AR's version of a fold-up 2 meter homer is shown in Photo C. He calls it the T-squared model because of the red T-shaped pieces on the ends. He mounted the dipoles (1/4" surplus aluminum welding rod) to thick phenolic material with standoffs (see detail in Photo D). The boom is a square plastic towel rack pole. Other builders have cloned his design using a square extruded aluminum boom, with equal success.

The end pieces pivot, and the whole thing folds up when not in use (Photo E). Bolts and wing nuts at the pivot points hold everything in place in either configuration. For electrical design information, see "Foxhunt Radio Direction Finder" by Paul Bohrer W9DUU in the July 1990 issue of *73 Amateur Radio Today*.

Photo C. Jason Pelaez (AH2AR's son) shows off the two meter homer in their spacious back yard.

Dave lives in Huber Heights, Ohio, which is just north of Dayton. Hams there are known for their public service activities and their world-class annual convention, but not for T-hunting. They have had to "import" DFers from the crack Indianapolis foxhunt group to help locate their high altitude balloon experiment payloads.

With urging from AH2AR and others, the Dayton Amateur Radio Association (DARA) is holding its first annual Winter Foxhunt. Dave hopes there will continue to be regular hunts, at least two or three per year, to train DARA DFers to find their own balloons and help police the bands.

We Save Your. . .

A well-known maker of search/rescue RDF gear (L-Tronics, Incorporat-

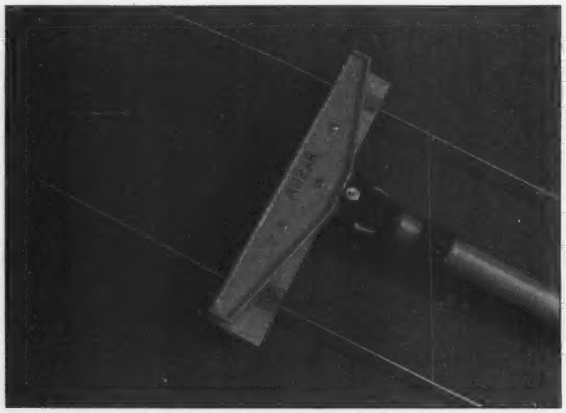

Photo A. Dave Pelaez AH2AR built this 70 cm homing DF set out of an extendible handle he found at the hardware store.

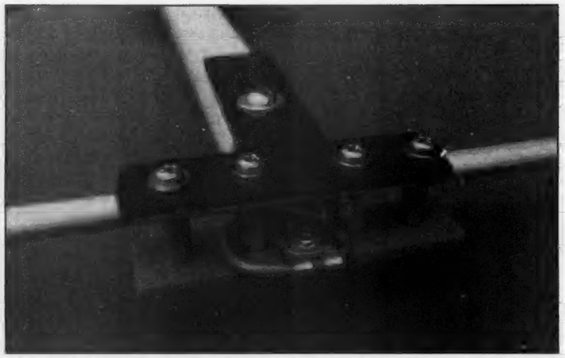

Photo D. This rugged mount keeps the dipole elements in place. Notice how the coax is supported with a lug to prevent stress on the solder connections.

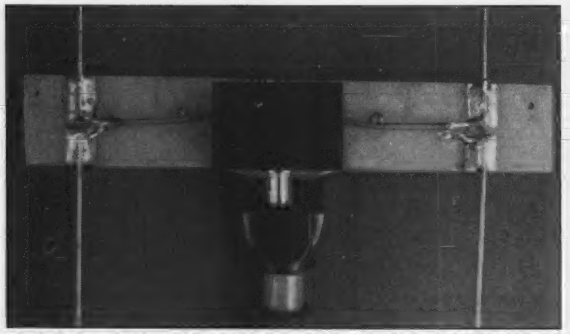

Photo B. Dave soldered his UHF antenna whips directly to the PC board. Advanced constructors could use stripline techniques to replace the coaxes.

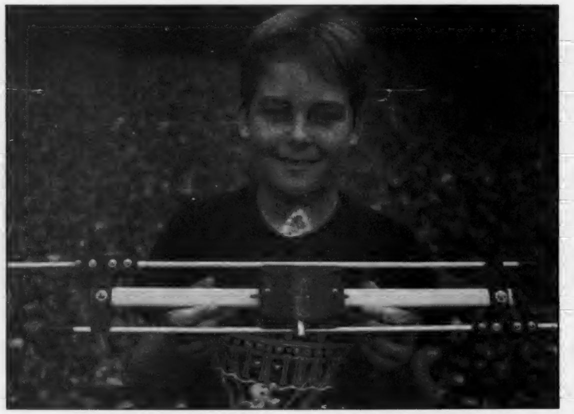

Photo E. The antenna folds up in seconds for easy transport.

ed, 5546 Cathedral Oaks Road, Santa Barbara CA 93111; 805-967-4859) sells decals, note pads, and jacket patches featuring a picture of a donkey being hoisted by a helicopter. The caption is: "We Save Yours." Get it?

Hams in search and rescue are often heroic T-hunters. But there are plenty of other ways to use RDF to help the public. In "Homing In" for January 1992, I wrote about hams in Arkansas tracking down a stuck public service transmitter. This month, I have two new incidents to report. If the present growth in T-hunting continues, our hobby may have a new kind of public service to brag about.

A Spooky Transmitter

The first item comes from Southern California. At about 3 p.m. on the day before Halloween, a signal appeared on the Verdugo TAC-1 frequency, which is used by the fire departments of Pasadena, Glendale, and Burbank. This intermittent carrier blocked out most other transmissions. The weak audio could only be described as "eerie."

Jami Smith KK6CU picks up the story: "I was called by Jack Haas KB6ZBS of the Los Angeles Sheriff Department. He knew I had a Doppler RDF set on my motorcycle." Jami, who is new to T-hunting but very enthusiastic, called veteran hunter Don Lewis KF6GQ, and they started the search.

Even though the stuck transmitter was near 154 MHz, KF6GQ found he could use his 2 meter mobile T-hunt beam to get bearings. "I was surprised how well it pointed in the right direction from my house," Don says. "All the way down the freeway it pointed in the right direction.

"When we got to Fair Oaks, the bearing shifted, and we ended up in front of the old abandoned fire department building. It still had antennas sprouting all over on top. Some firemen happened to be there at the time because in the old police station next door there was a haunted house, put on by a charitable organization.

"I couldn't get a good enough bearing at that point, so we got somebody to open the fire department building. But no radios were on there. I then went outside with the scanner, antenna off, and determined that the signal seemed to be coming from the old police building, where the haunted house was.

"Jami came out then with his little sniffer (similar to the W9DUU model), and it agreed with my police station bearings. But we were told we couldn't go in there. So we called the Pasadena Communications Coordinator to come down. He went into the building, went straight to the right room, and turned off the transmitter. It was VOX-controlled by a telephone, and somebody had knocked the receiver off the hook. The strange sounds on the audio were from the haunted house, of course."

Stealth T-Hunting

Heroic ham story number two comes from the Gulf Coast of Mississippi. It all started with a burglary at a Pascagoula communications equipment dealer on Sunday morning, November 17. Among the $10,000 worth of loot taken by a gang of youths were some VHF transceivers awaiting delivery to a shipyard.

That evening, a security guard reported unauthorized transmissions on his frequency. Soon other services, including police and fire channels, were targeted. "They were taunting the police on the radio," says Gary Fender W6SZX, who wrote me about the caper.

The Pascagoula Police contacted Chuck Bardsley KE5TL, a Navy antenna expert and regular T-hunter. The authorities suspected that the signals were coming from nearby Moss Point. They coordinated with the Naval Investigative Service (NIS) and the Moss Point Police Department (MPPD) to lay out a plan.

That night Chuck, Gary, Fred Wolf KE5SJ, and Ray Walker KB5FDW hooked up their RDF gear and met with the NIS agent and a ten-man team from the MPPD. Each T-hunter was accompanied by an armed detective carrying an 800 MHz frequency-hopping radio set. "There was concern that the thieves would see or hear us and quit transmitting," Gary said, "but the 800 MHz gear could not be heard on the thieves' scanners."

W6SZX continues: "After determining the general area of the transmissions, each T-hunt vehicle was assigned a hiding position around the suspected area. Unlike our regular T-hunts, the hunters had to be very inconspicuous. Driving around with rooftop quads and yagis was out of the question.

"We hid behind buildings and stadiums, and in schoolyards in the dark with the car doors closed and receiver audio low. I had a little hand-held yagi. I just held it outside the car and used a field-strength meter.

"At first there was no QRM from the thieves, but MPPD got a fire truck to use its siren for a few minutes to stir things up. The thieves' transmissions were very short, but with much patience we were able to get bearings.

"We were able to triangulate to one house from three directions, each about a block away. Based on that, the NIS and MPPD got a judge to issue a search warrant, and they went in. We were not allowed to go with them because of the danger. The crooks confessed right away and took the police to the stolen stuff."

Four suspects were under arrest by 2 a.m. Tuesday. The investigation continued, resulting in three more arrests by Wednesday night. All equipment was retrieved and prosecution is in progress.

These fellows get my vote for ham heroes! The *Mississippi Press* newspaper played it up by telling how "radio hams cooperated and were able to pinpoint the source of the transmissions." Gary says the best reward was when the police affectionately dubbed them "The Snoop Squad."

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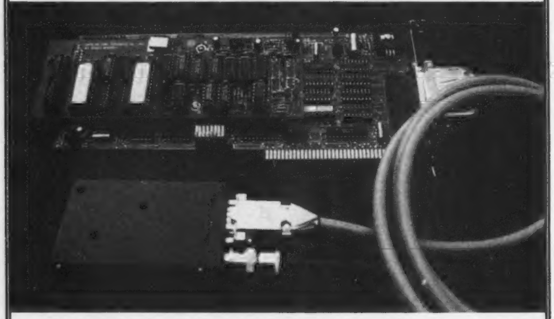

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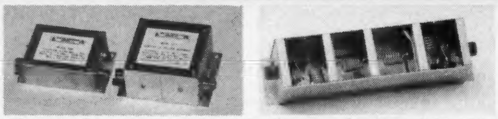

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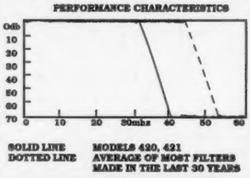

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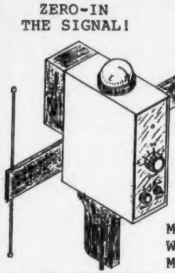

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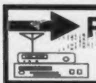

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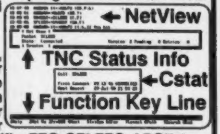

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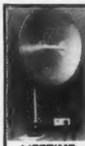

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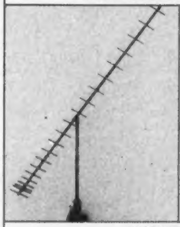

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The QRP Argonaut II

The new Ten-Tec Argonaut II is now on the dealer's shelves. The Argonaut II adds a new dimension to low power amateur communication. (I was lucky enough to obtain an Argonaut II at last year's Dayton Hamvention).

If you have ever own or used one of the older Argonauts, you're in for a surprise! The Argonaut II has a completely new look and feel. It weighs in at 8 pounds, 10 ounces (3.91 kg.). Overall dimensions are 3-3/4" high by 9-3/4" wide by 12-1/2" inches deep. It's not going to fit inside a briefcase, which is why it's the first Ten-Tec radio with a handle on the side. The handle makes carrying the radio from place to place easy.

The Argonaut II's fully synthesized PLL design provides general coverage receive from 100 kHz to 30 MHz for CW, SSB, AM, and FM. It transmits in FM, but not AM. Dual VFOs are enjoyable for operating split frequencies on all ham bands from 80 through 10 meters.

Lots of Memory, but No Scanning

Of a total of 48 memory channels, 00–31 are simplex and hold only one frequency/mode setting. Memory channels 32–47 are duplex memories and hold the frequency and mode information for both VFO A and VFO B. A separate scratch pad memory can be used to hold temporary settings without affecting the nonvolatile RAM—a welcome feature. Because of the nonvolatile RAM, you won't lose the radio's memories when you turn off the rig or remove power. The clock, which is displayed to the right of the main frequency, continues to run when power is removed. A small user-serviceable 3-volt lithium battery maintains the clock memory.

Although the Argonaut II has 48 memories, you can't scan any of them. As a matter of fact, you can't scan anything! I don't find this to be a drawback, as I wonder just how many people scan the bands in real life anyway.

The Argonaut II features a large backlit LCD display. You can turn off the electro-luminescent back lighting via a top-mounted switch. The LCD is a pleasant green glow, clear with good contrast. For me, it could have been a bit brighter. As with most LCD displays, you'll lose contrast as you view the display from an angle. Straight-on viewing is best.

All the operating parameters are shown on the display. This includes the S-meter and RF power meter. They're one in the same, and are switched over between transmit and receive. The display can become rather busy when using the full QSK. If you spin the VFO knob at just the right speed, the LCD will display odd characters. Slow down or speed up, and it goes away. I called Ten-Tec and was told that the speed of the tuning knob, when it hits the speed of the multiplexing used by the LCD, shows only one segment at a time being displayed. This is normal.

When I first started using the Argonaut II, the built-in clock caught my eye. As time went by, I really enjoyed using this nice feature. When using the RIT control, the clock goes away and the display shows the RIT offset.

The main tuning control is smooth, and features variable tuning rates from 10 Hz to 500 Hz, selected with the FAST button and mode. The main tuning knob has a friction clutch to add extra drag. I found I liked the least amount of drag on the VFO knob.

There are two way to change frequency: via the keypad or the main tuning knob. To use the keypad, you must key in the entire frequency. For example, if you want 14.023, that's exactly what you key in, including the decimal point. You can also call up a memory location instead of tuning up to the frequency you want. Space does not allow me to go into deep detail on programming the memories, or on the many different tuning features of the Argonaut II.

Photo. The Argonaut II is a great rig for QRP operation.

Power Requirements and Usage

Putting the Argonaut II on the air is simple. You need only add power, antenna, and key or microphone. Although Ten-Tec states "Energy efficient for practical battery operation," I found that you need a BIG battery to operate the Argonaut II any length of time. Ten-Tec specifies the current at 1.2 amps for receive and 3 amps for transmit. Using a Fluke 77 digital meter, I measured the current at 920 mA at 12.5 volts with no signal. By turning off the backlit LCD, I was only able to see 60 mA worth of energy savings.

If the supply voltage drops to 11 volts or under, the Argonaut II will fail to operate properly. In fact, the Argonaut II will do all kinds of strange things when the supply voltage is low. The review unit would allow me to transmit out of band! Yup! You name it, I could transmit there. Fixing the problem is a two-step procedure. First, return the supply voltage back up to 12.5 volts. Then do a soft microprocessor reset by depressing the CLEAR key while turning on the POWER switch.

During transmit, the Argonaut II demands 2.3 amps from the battery while supplying 5 watts of RF into a 50 ohm dummy load. On 40 meters, the current was a whopping 5.4 amps for 5 watts of RF. I don't know the reason for the extra current on 40 meters, and didn't touch base with Ten-Tec on this matter. The Argonaut II produced 5 watts across all the bands.

You can add the optional power attenuator for really low power. You get six calibrated steps from 5 watts to 10 mW.

Mode and Frequency Selection

Placing the Argonaut II on CW is simply a matter of selecting the mode and frequency. If you have the annunciator on, the radio sends CW when the mode is changed by selecting a "C" for CW, and either an "L" for lower sideband or a "U" for upper sideband. Of course, it's bells and whistles, but after a while I enjoyed using it. You can turn the annunciator off if you so desire.

There's a built-in VOX for SSB use. The Argonaut II has the new "soft touch" controls for setting the VOX gain, VOX delay, and anti-VOX operation. You can also set the sidetone level, but not the sidetone pitch with the soft touch keys. The sidetone pitch is internally set, and while you can change it, the tone is factory set for 700 Hz. The sidetone has dual functions: CW sidetone and spot tone. Changing the pitch of the sidetone will screw up the spot function.

The RF meter becomes an SWR meter when the FWD/SWR button is pressed. In the FWD position, the meter indicates output power with full scale equal to 5 watts output. In SWR position, the bar graph indicates reflected power. Below 2:1 SWR, the scale is expanded by blinking the bar graph segments. A perfect match is indicated when the last segment stays off continuously. It took some time to get use to this way of measuring SWR.

I did have some trouble with the key line. Some keyers I used wouldn't key the radio. The RF came on, but no sidetone was produced. Shorting out the KEY jack on the back of the Argonaut II produced sidetone and RF. My keyers use reed relays, not transistor switching, so there should be no problem keying to ground. I cured the problem by cleaning the plug and jack going to the Argonaut II from my keyer.

The Argonaut II continues with the famous Ten-Tec keying—fantastic! In fact, the keying sounds a bit better than my Argosy II. I also enjoy being able to slow down the QSK to semi-break-in keying. There is a small reed relay clicking on the chassis when keying. I used the Argonaut II for AMTOR, and it worked without missing a single letter. Packet operation was not tried.

The 8-Pole Filter

One very important new tool against QRM is the variable 8-pole crystal filter. You have an infinite choice of filters between 2.5 kHz and 500 Hz! If you're like me, sometimes the 500 Hz filter is too narrow, and the 1.8 kHz is too wide. Here you have a choice, and by tuning the bandwidth control, you can pick *exactly* the filter you require. Along with the IF passband tuning, the Argonaut II is a real fighter in the crowded bands. There's an RF gain control and a -20 dB attenuator which help reduce front end overload caused by stations nearby. An audio notch filter rounds out the QRM tools. The notch filter works quite well, it's just a bit of a pain to adjust as the notch is very sharp. Slow tuning is required!

When I don't feel like playing ham radio, I may feel like listening to the BBC on 5972 kHz. The Argonaut II provides AM reception with a 6 kHz ceramic filter. The variable bandwidth tuning is not available when receiving AM. The same is true for FM reception. The squelch for FM operation is internally set. You can turn the squelch on and off from a top mounted switch. The FM transmit deviation is preset and independent of the MIC gain.

The Receiving End

The receiver of the Argonaut II is very good. I'm impressed with the way it performed at Field Day. Operating on 40 CW with two other rigs on the same band, the Argonaut II knew the other CW station was (about 40 feet away) there, but I still made contacts. The phone operator, using an IC-735 on the same band, threw his hands in the air and took a walk.

There are some whopper birdies in the Argonaut II. You have to hunt for most of them, but some jump right into your arms. With an antenna connected, most birdies are under the noise level. The PLL noise can be heard, but I find the Argonaut II all and all a very quiet receiver. I don't have the means to measure PLL noise. I did notice I had to run the AF gain control almost three-fourths full for enough audio for me.

The Argonaut II has a noise blanker that really works. Mr. woodpecker *[an over-the-horizon backscatter system for detecting aircraft]* was not on, so I was unable to see if the noise blanker is effective on him.

One point I did not like with the receiver is the ability to copy both sides (from zero beat) of a CW station. The Argonaut II sounded very much like an expensive direct conversion rig! This condition only occurs on CW. When on SSB (upper or lower sideband), a CW note does not exhibit this problem. Seems you should move the passband to one side or the other to let the unwanted signal fall out of the filter. I tried this, and it works, but it wasn't in the manual as a solution. In defense of Ten-Tec, the manual is only an interim manual with the "real" one still in the computer at Ten-Tec.

All and all, the Argonaut II is a fine radio. It's not cheap, but then again, just how much do you think a radio like this should cost? Remember all those crystal filters you don't have to buy, thanks to the variable bandwidth 8-pole filter! The street price for the Argonaut II seems to be hanging around $1200.

The Argonaut II has some unfinished edges, but it has earned the right to be called an ARGONAUT!

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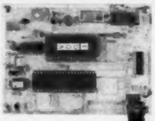

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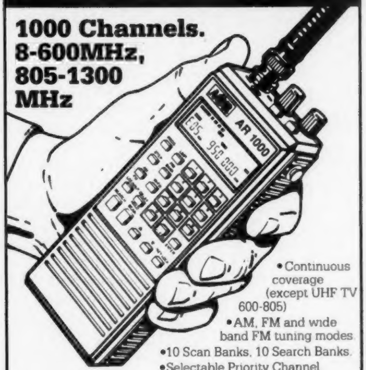

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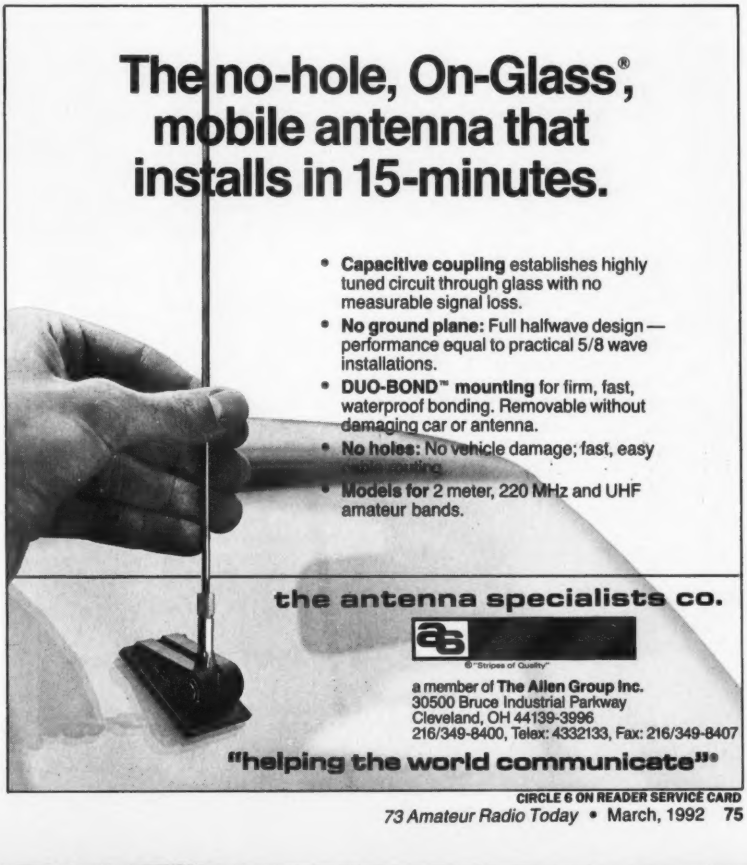

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Software Sources

In the past I have often mentioned this or that program or utility which can make an amateur's life easier. With the wide base of personal computers in the ham community, the probability of finding software that meets your needs is fairly high. Nevertheless, locating the source of that software is another matter.

Swapping with friends is probably the most direct way of obtaining the latest shareware or public domain offering. But the program you heard about may not be available locally, or you might not be able to pin down your friend for a copy. The question of "viruses" also enters into the picture when performing a personal swap.

The next step up the ladder to successfully locating your software is the local bulletin board system, or BBS. Here in the Baltimore area we have many such BBSs, several of which emphasize a particular machine or program type. Games, graphics, utilities, and even amateur radio, all have their proponents. Of course, most local machines are limited to one telephone line, so a long winded (busy-fingered?) caller can tie up the machine for hours. Also, the quality of the stuff online is often dependent on the perseverance of the system operator (SYSOP). It's a big job, and the files frequently fall into disrepair. Some boards charge, and some request uploads. Some boards are great, and others passable. Some are forgettable. I guess the old adage prevails: You pays yer money and takes yer choice.

CompuServe

On the national level, the pickings get better. In my opinion the biggest, most complete board is CompuServe (CIS). This massive data information service has just about everything you could want—for a price. Access CIS may be through a text based terminal, or a variety of "front ends." The CompuServe Information Manager (CIM) is CIS's proprietary terminal program that accesses the service through a windowing type environment. CompuServe is not cheap, but it is good. If you need some information, and are willing to pay for it, CIS is the answer.

To the best of my knowledge, all of the national data services screen all files available for download for the presence of viruses and trojans. While viruses should not be a problem, I'd still exercise caution with new files.

Delphi

Another national board I have spoken of is Delphi. Significantly smaller than CIS, Delphi boasts many forums, including a hobby forum that has a section for ham radio, and thousands of programs and information packets to download. Using a simple text-based interface, about any terminal program can dial into Delphi and find something of use.

America Online

This national online service distinguishes itself both by its interface and its cost effectiveness. The log-on screen of America Online will show you what I mean by a unique interface. America Online is built upon the Geoworks operating system. This is a graphical, windowing environment that is similar to, yet different from, Microsoft Windows. The program, which does require a graphics card, can be booted either from the DOS prompt, or run from a Geoworks system. It can also be run under Windows.

The terminal program installs easily from supplied floppy disks to a hard drive, configuring itself to the installed system. Installation is well behaved, with no wild rewriting of the AUTOEXEC.BAT or CONFIG.SYS files taking place. Once the program is installed, it dials out on an 800 toll-free number to locate current phone numbers for your area. You are asked to choose which number to call, and an alternate number as well. This information is stored in the program's configuration files, to be used as indicated.

Logging onto America Online is about as easy as clicking a mouse pointer and typing in your password. The America Online program does not store your password internally. Having entered the system, the welcome screen is displayed. Flags and icons tell you of new features and top news stories, and let you know whether you have E-mail waiting or not. Clicking on any of these icons will quickly take you to the desired feature.

Like many other large BBSs, America Online features many special interest groups, supporting a variety of topics. Computer and non-computer SIGs are present, ranging from education to religion, from aviation to amateur radio. Amateur radio? Yep, Figure 1 shows a screen from the Ham Radio SIG. Here, we are looking at the description of a file available for downloading that deals with computer control of Kenwood radios. Other available files are visible in the partially covered window to the right of the screen. In the Ham SIG are separate directories for IBM PC compatibles, and for Apple, Mac, and text files as well. A comparatively complete listing.

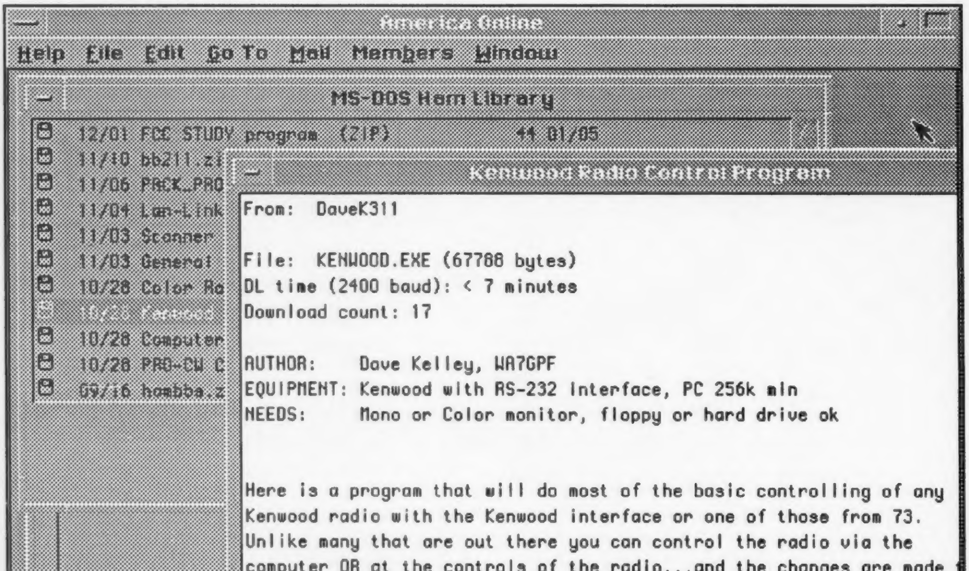
If you are going to pay for an online service, though, there has to be more than SIGs and program downloading. America Online comes through in this regard, with a full spectrum of games, some multi-player, in addition to news and reference material. The Grolier Online Encyclopedia is available for searches, and even contains information about ham radio.

Pricing for America Online is reasonable, with average hourly rates at around $5 an hour. I can't be more exact with the price, as the folks there tell me that they are in the process of reviewing and revising the price structure. Still, the overall cost is quite competitive, and remains on the low side of national online databases.

Getting On Line

Interested? About all it took to convince me that America Online was a valuable service was playing with it for a few hours. If you want to see for yourself, there are at least three ways you can gain access. The easiest way is to call them at 1-800-827-6364 and say you want to try the service. The next easiest way is to send in one of the cards or coupons bound into most of the computer magazines out there these days. Finally, if you send me your name, address, phone number, computer type, disk size, and all that other stuff, I will forward the information to America Online for you, and see that you receive a set of disks with all the information you need to try out America Online.

I've got more on tap for next month, and the pile of your letters is getting high enough that I may just devote a column or two answering questions, both simple and complex. Keep 'em coming! For now, you may reach me on CompuServe (75036,2501), Delphi (MarcWA3AJR), or America Online (MarcWA3AJR), as well as by mail at the above address. 73


America Online
Help File Edit Go To Mail Members Window
MS-DOS Ham Library
Kenwood Radio Control Program
Download File
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12/01 FCC STUDY program  (ZIP)        44 01/05
11/10 bb211.zi
11/06 PACK_PRO
11/04 Lan-Link
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10/28 Color Ra
10/28 Kenwood
10/28 Computer
10/28 PRO-CW C
09/16 hambba.z
```

```
From:  DaveK311

File:  KENWOOD.EXE (67788 bytes)
DL time (2400 baud): < 7 minutes
Download count: 17

AUTHOR:     Dave Kelley, WA7GPF
EQUIPMENT: Kenwood with RS-232 Interface, PC 256k min
NEEDS:      Mono or Color monitor, floppy or hard drive ok


Here is a program that will do most of the basic controlling of any
Kenwood radio with the Kenwood interface or one of those from 73.
Unlike many that are out there you can control the radio via the
computer OR at the controls of the radio...and the changes are made
the screen either way.  It includes an ID timer, a way to print you
memory listing from the radio and it can even send the frequency in
Morse Code it you press the space bar.  ALSO, the frequency is
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Figure 1. America Online's Ham Radio SIG. This screen describes a file on computer control for Kenwood transceivers.

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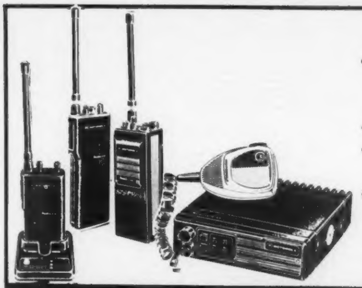

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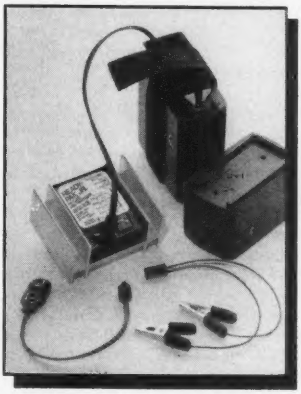

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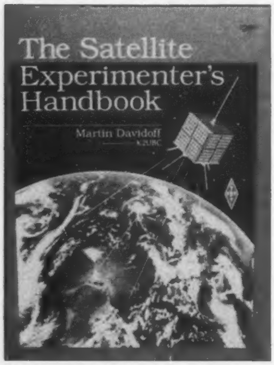
Satellite Operation Resources

For new amateur satellite enthusiasts, finding information about the hamsats can be a problem. There never seems to be enough data to satisfy the appetites of newcomers. Fortunately, there are organizations around the world dedicated to hamsat programs, books covering the topic in depth, magazine columns, packet radio distribution of bulletins, standard telephone BBS systems with data, tracking programs, and satellite operational information resources.

Organizations

AMSAT-NA, the Radio Amateur Satellite Corporation of North America, is the best all-around source for current information on the amateur satellite program. Membership is $30 per year. This pays for the bi-monthly magazine and helps with the high cost of satellite design, construction, and associated launch expenses. The magazine, *The AMSAT Journal*, provides construction, software, and informative articles. To join, call (301) 589-6062, or write AMSAT, 850 Sligo Ave. #600, Silver Spring MD 20910. New members receive a membership certificate and a package of introductory material about the amateur satellite program. They also get discounts on all the many software products AMSAT sells for satellite tracking and telemetry decoding.

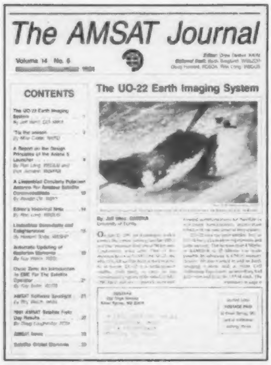


The Satellite Experimenter's Handbook
Martin Davidoff
K2UBC

Photo A. Satellite Experimenter's Handbook *by Martin Davidoff K2UBC is available from AMSAT or the ARRL.*

AMSAT volunteers provide a weekly news service via packet radio bulletins, updating satellite activities and related topics. Orbital data for popular satellite tracking software is also available. The data and bulletins can be found on various terrestrial BBSs and via UoSAT-OSCAR-14 and the microsats. The AMSAT/DRIG (Dallas Remote Imaging Group) BBS at (214) 394-7438 is an excellent source of current information and data.

Project OSCAR provides a bi-monthly newsletter, "The OSCAR Letter." To subscribe, send a check for $10.00 made out to Project OSCAR, and mail it to "The OSCAR Letter" editor, Leonore Guimont KA6UCD, 5030 July St., San Diego, CA 92110-1112. Include six self-addressed-stamped envelopes (52 cents postage on each) with your callsign large and clear in the upper left-hand corner. Their publication typically runs 15 pages and contains information pertinent to California activities of Project OSCAR and related amateur satellite projects. To become a supporting member of the organization, send a check for $20.00 along with six address labels or addressed envelopes.



The AMSAT Journal
Volume 14 No. 6
CONTENTS
The UO-22 Earth Imaging System

Photo B. The AMSAT Journal *is a bi-monthly publication for AMSAT members.*

AMSAT-UK, the Radio Amateur Satellite Organization of the United Kingdom, is another excellent source of input via their monthly magazine *OSCAR News.* A minimum donation of 19.25 pounds sterling per year (about $36) is required for North American members. They accept VISA and Mastercard, so payment is easy. From the U.S., the phone number is 1-011-44-989-6741 (UK business hours). FAX: 1-011-44-989-3430 (24 hours). The address is AMSAT-UK, the Secretary, 94 Herongate Road, Wanstead Park, London E12 5EQ, England, United Kingdom.

Several other AMSAT organizations around the world publish magazines and newsletters. AMSAT-DL in Germany has one of the largest, but it is in German. AMSAT Australia prints a newsletter for members, as does South Africa AMSAT, but the cost to receive these becomes prohibitive since they do not accept foreign currency or credit cards.

Newsletters

There are currently two independent newsletters published in the U.S. addressing the amateur satellite program: the "OSCAR Satellite Report" (OSR) and the "Satellite Operator." Both are available from R. Myers Communications, P.O. Box 17108, Fountain Hills AZ 85269-7108.

A Beginner's Guide To OSCAR-13
A step-by-step guide to hardware and operating procedures necessary to work the World through OSCAR-13
by
Keith Berglund, WB5ZDP
AMSAT Area Coordinator

Photo C. A Beginner's Guide to OSCAR-13 *by Keith Berglund WB5ZDP is a valuable AMSAT publication with useful information on setting up and running a complete satellite station.*

OSR covers timely news items with its two-week publication schedule. Regular features include satellite orbital element sets, DX news, and satellite operating schedules. Other features and sometimes-controversial editorials also appear. The cost is $29.00 per year in the U.S., including first class mail delivery.

"Satellite Operator" is devoted to in-depth discussions on technical satellite topics and operational information, including weather FAX and NASA activities in addition to amateur satellite material. Publication is monthly for $33.00 per year via first class mail. When ordered together, OSR and "Satellite Operator" are $56.00 per year.

Columns

Most amateur-radio magazines have columns devoted to amateur satellite topics. This column has been a regular feature since January 1987. At least once a year, "73" also has a special satellite issue with a full range of articles devoted to OSCAR activity.

QST, World Radio, and *Spec-Com* provide regular columns about amateur satellites. *Popular Communications* has a column, "Satellite View" by Don Dickerson N9CUE, that often carries information on amateur activities.

The Radio Society of Great Britain provides a satellite column in its magazine *Radio Communications,* while *Practical Wireless,* also from the UK, has featured a satellite column by Pat Gowen G3IOR for several years. A few other foreign publications with amateur satellite columns include *Ham Radio Today* (UK) and *DUBUS* from Germany (English version).

Books

While there have been many books about satellites, only a few feature amateur radio satellites. Finding these books has been a problem for the new enthusiast trying to learn about AMSAT and the OSCARs.

The Satellite Experimenter's Handbook, an ARRL publication, is the most comprehensive guide to the hamsats. Every devoted satellite chaser should have a copy. This large-format softcover book by Martin Davidoff K2UBC can be purchased from AMSAT, the ARRL or at many radio stores *[also from "Uncle Wayne's Bookshelf"]* for $20.00. Topics covered range from the history of the amateur satellite program to orbital mechanics and antenna construction.

A Beginner's Guide to OSCAR-13 by Keith Berglund WB5ZDP is an AMSAT publication describing what it takes to get on the air with AMSAT-OSCAR-13, the most advanced amateur satellite in orbit today. Since its introduction in 1989, this publication has been a favorite for newcomers. The price is $7.00 from AMSAT.

The ARRL *Satellite Anthology* is a compilation of *QST* articles on amateur satellite operation and hardware. It brings together many of the best papers in one reference source and is $5.00 from AMSAT or the ARRL.

For those interested in satellite telemetry, *Decoding Telemetry from the Amateur Satellites* by G. Gould Smith WA4SXM is a good choice. Gould describes telemetry systems of past and current spacecraft complete with details on the various formats and conversion formulas encountered. This is another AMSAT publication and sells for $15.00.

Number 232
November 1, 1991
The Southwest Division Convention Shows Off Some New Software
Progress on DOVE
Short Bursts

Photo D. "OSCAR Satellite Report" is a bi-weekly newsletter for satellite enthusiasts containing timely information on the amateur satellite program published by R. Myers Communications.

One of the newest AMSAT books is *The PACSAT Beginner's Guide.* It covers the basics on setting up and operating a packet satellite station. The original version of the guide did not include information on high speed 9600 bps operation via U-O-14, but it did thoroughly discuss 1200 bps activity through PACSAT-OSCAR-16 and LUSAT-OSCAR-19. For $10.00, the book includes PC software for satellite access on a 360K 5.25" disk.

OSCAR Satellite Revue by Dave Ingram K4TWJ is an anthology of *CQ* magazine articles from the 1980s. It also provides updates to those articles based on current information. Published by MFJ, this 43-page booklet can provide another point of view of the amateur satellite program. The price is less than $10.00 from most ham radio stores.

The *Space Radio Handbook* by John Branegan GM4IHJ is an RSGB publication. Published in 1991, this 242-page reference starts with space radio physics. Later chapters cover tracking methods, reception techniques, and many other topics through to the future of amateur radio in space and even lunar beacon systems. This new book is not easily found in the U.S., but inquiries can be sent to the Radio Society of Great Britain, Cranborne Road, Potters Bar, Herts EN6 3JE, England, United Kingdom.

Every year AMSAT hosts a space symposium. The proceedings of these gatherings are typically published by the ARRL. Copies can be obtained for $12.00 each for recent years. The latest, from the November 1991 symposium, makes excellent reading, and contains 258 pages of material ranging from S-band principles to South African satellite efforts. ■

SATELLITE OPERATOR

Number 13 October 1991

OSCAR 23: A French Amateur Radio Telescope

this issue

Photo E. "Satellite Operator" is a monthly publication from R. Myers Communications featuring articles of interest for satellite operators.

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. You may also upload a listing as E-mail to Sysop to the 73 BBS, (603) 525–4438, 8 data bits, 0 parity, 1 stop bit. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

I am trying to locate schematics and/or a power supply for an old Collins KWM-1. *Bob Harwell AB4AV, 3005 Lakeshore Blvd., Saint Cloud FL 34769. (407) 957–7659* or *(407) 843–8484.*

Fellow ham needs programming documentation for ICOM U-16 HT. Will pay for cost of duplication and postage. Can also accommodate file transfer through 2400 baud modem. Contact *Roy Holloway*, with price and method, at *(414) 927–5308*, or via *P.O. Box 436, Reeseville WI 53579-0436.*

I have a complete collection of *73* I'd like to find a new home for. *Dan Lester, Box 7606, Boise ID 83707-1606.*

I would like to hear from someone who can tell me how to connect my Yaesu FT-101E to the MFJ-211 Digi-Dial. This is a discontinued adapter which shows the operating frequency on a frequency counter. *Tony Stalnaker WA4LPJ, 2358 Old Al. Rd., Thomaston GA 30286.*

Wanted: Schematic and any other info on Model RAS-5 receiver and matching power supply (mfd. Jan. 7, 1943, contract number NXss20976). Thank you. *John Lovett KD4EUH, 2716 Gerald Ford Dr. East, Cordova TN 38018. (901) 388–8745.*

I am looking for a schematic or info on jumper placement for AC DC Electronics (Emerson) Model RE754B power supply. I will pay all cost. *Mary N1HFP, 28 Maywood Ln., Bristol CT 06010.*

We will help you to find friends among Russian radio amateurs who collect postage stamps, badges, color postcards, little models of ships, cars, airplanes, etc. We will publish bulletins with lists of collectors. Our bulletins will be sent to all who need our information or help. To be included in our bulletin, please send your name, callsign, address, and kind of collecting. *SASE to Val Sushkov, P.O. Box 3, Lipetsk 398000, Russia.*

Wanted: One copy of an *ARRL Handbook* dated between 1950 and 1965, for the purpose of educating a budding amateur in the field of tube gear. I will also consider any other texts pertaining to tube gear construction and repair. I will pay any reasonable costs and shipping charges. *James Hayes, 34 Treadway St., Ticonderoga NY 12883*; or call *(518) 585–6395 between 9 a.m.–8 p.m.* and leave a message.

Needed: Donation of 6 meter beam. Please mark "gift" on package and ship to *E.B. Martin, Box 113, Plymouth, Montserrat, Leeward Is., West Indies.*

Needed: Donation of 6 meter amplifier (for 10 watt transmitter). Please mark "gift" on package and send to *Andre C. Sampaio PY0FF, P.O. Box 1, 53990, Fer. de Nahorna, P.E. via Brazil.*

Wanted: Schematics, service, or operation manuals, and/or any other info for HT "Azden PCS-300." I will pay reasonable copying/mailing costs. *Louis Vieiera-Belen KA7JHQ, 5544 Balboa Arms Dr., San Diego CA 92117. (619) 565–9007.*

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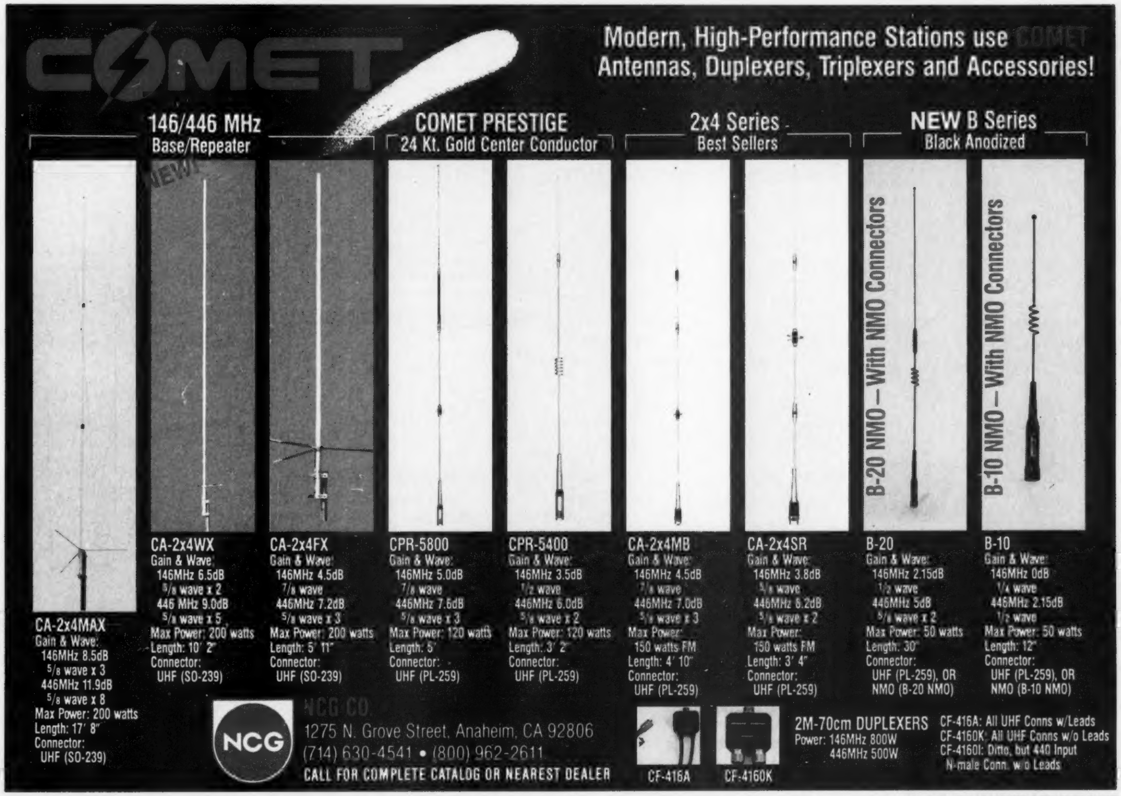

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Gain & Wave:
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446MHz 7.2dB
5/8 wave x 3
Max Power: 200 watts
Length: 5′ 11″
Connector:
UHF (SO-239)

CPR-5800
Gain & Wave:
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7/8 wave
446MHz 7.6dB
5/8 wave x 3
Max Power: 120 watts
Length: 5′
Connector:
UHF (PL-259)

CPR-5400
Gain & Wave:
146MHz 3.5dB
1/2 wave
446MHz 6.0dB
5/8 wave x 2
Max Power: 120 watts
Length: 3′ 2″
Connector:
UHF (PL-259)

CA-2x4MB
Gain & Wave:
146MHz 4.5dB
7/8 wave
446MHz 7.0dB
5/8 wave x 3
Max Power:
150 watts FM
Length: 4′ 10″
Connector:
UHF (PL-259)

CA-2x4SR
Gain & Wave:
146MHz 3.8dB
5/8 wave
446MHz 6.2dB
5/8 wave x 2
Max Power:
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Length: 3′ 4″
Connector:
UHF (PL-259)

B-20
Gain & Wave:
146MHz 2.15dB
1/2 wave
446MHz 5dB
5/8 wave x 2
Max Power: 50 watts
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B-10
Gain & Wave:
146MHz 0dB
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446MHz 2.15dB
1/2 wave
Max Power: 50 watts
Length: 12″
Connector:
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CIRCLE 54 ON READER SERVICE CARD

Above & Beyond

Continued from page 48

waveguide feeding the shack. Normal line of sight contacts on microwave, while the best possible, do not limit my home station. The old "line-of-sight rule" can be violated in some cases. What we take advantage of is the ability of microwave signals to reflect off of a targeted object. Microwave signals are highly directive and will reflect off of hills, buildings, water tanks, and the like.

The signals scatter much like a pool/snooker ball whose action, when hit, is to carom off the side rail of the table at a specific angle. Microwave energy is directed at objects in the same way. How perfect the focused reflection is depends on how perfect the surface of the object is. In most cases, objects reflect the microwave energy in a scattered signal at lower return levels.

Signals returned by the scattering method are by nature quite weak, but still detectable. Tests from my home to N6IZW's home (about five miles distant) are not possible on 10 GHz directly, even with high power and high gain antennas. However, when signals are reflected off a mountain to the northwest, we can communicate on 10 GHz SSB and narrow band FM. Both of our transmitters run between 5 to 10 watts, and signals at times are 15 to 20 over S-9.

A recent test involved mobile operation with N6IZW. We were able to hold mobile communications over a several-mile path. I had my antenna aimed at the same mountain northwest of my location, and N6IZW used an omni-slot antenna for transceiver operations. It worked quite well, even when in motion. Now, it was not studio quality, but it did provide somewhat better than marginal operations at times. Flutter and Doppler and all other effects were observed on the signals. VHF was used for linking up.

As another example, W2TTM and K2RIW Dick report bouncing signals off the 110 story World Trade Center (WTC) in New York City. W2TTM is 20 miles south of WTC-NY, running 200 mW. And Dick K2RIW is 35 miles east of WTC-NY, making for a 55-mile path. They have a sched on 10 GHz twice a week from both homes. Their stations are quite something. Dick has a two-foot dish at the 165-foot level of his tower, which also sports a 10 GHz beacon for the rest of the week.

W2TTM has a two-foot dish at 50 feet, and a 15-foot dish at 30 feet. The 15-foot dish has a 0.5 degree beamwidth and no elevation control yet. W2TTM reports that the 15-footer gets a 17 dB stronger signal than the two-footer. Sometimes it's the other way around; they think it's got something to do with the signal's elevation of arrival. On the light side, they might have turned the lights off or opened windows at the WTC-NY, shifting signals between antennas. It can get spooky at times.

Experimentation

You can observe the same effects on HF, but on microwave the demonstration can be carried out on a more tightly controlled model. Wavelength being smaller, experimentation can be carried out on top of a workbench. By having your test scaled down to manageable portions, it's no problem to put a gain antenna in your shirt pocket. Try that on 80 or 20 meters. With the entire antenna test range on the bench top, changes can be made rapidly, and a real grasp of the problems shortly becomes apparent. It's a very rapid educational process, right in front of you.

I don't want to undercut the popular application of wideband FM by promoting a shift to SSB, but rather present insight into other methods of operation. When I operate from the field I take both my wideband and SSB rigs and have a great deal of enjoyment with both of them. I have had many years of operation totally on wideband, and the shift to SSB was a gradual move towards adapting technology available via the surplus market to our amateur endeavors. (I waited till I could afford it.) Though the equipment is more costly, it seemed to be a natural progression on station improvements for 10 GHz operation.

PUFF—The Magic Software

This is not really a new product, but rather one that I did not fully examine when I first heard about it. I had been on the prowl for quite some time for a computer program that could generate microwave designs. Now there are several commercial programs available, but the cost is high. I recently discovered a program available from Cal Tech that does everything I could ask for. The program is called PUFF, a computer aided design program for microwave integrated circuits. To run PUFF you need an IBM PC, AT, PS/2, or compatible; a graphics card and display; and DOS 3.0 or later. Best performance is with a computer with 640 kilobytes of memory and a hard disk drive. A math co-processor will speed things up quite a bit, but is not required.

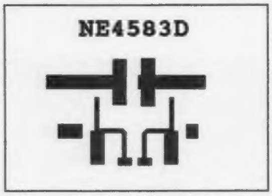

Figure 2. Laser printer sample of 10 GHz amplifier from trial test of amplifier construction. Scale 1:1.

The thing that makes this so exciting is that Cal Tech is making this program available postpaid (US) for $10 dollars. It comes with a manual to get you started. To not burden them with casual requests, don't order the program unless you are serious in applying the information they provide through this generous offer. PUFF is intended to be a serious educational tool for engineering students.

In the upcoming column, I will be going over PUFF and many applications that Kerry N6IZW and I have designed. Currently we are working on designs for amplifiers in the 5.6 and 10 GHz bands. The beauty of this is that you can customize a previous design for a specific device. All you need are the device's parameters to custom design a new layout. We encountered a few errors at the beginning, but our second cut at design produced excellent circuitry that worked quite well. The program can do the entire design from start to finish, producing a final artwork circuit board file.

We dumped the finished PUFF file to a laser printer for camera ready artwork. (Dot matrix is supported, but the quality is not as good, of course.) The thing to prove was how good PUFF computations were compared to our final measured construction. I am happy to report that the 10 GHz amplifier we constructed using PUFF worked great. We tweeked the first design up to the point of oscillation (18 dB gain at 10 GHz). Normalized output was very stable and predictable at the 10 to 12 dB gain range.

The second cut at PC board design produced a no-tune gain of 10 dB at 10 GHz on power up. I just finished cutting several new versions of the boards to test, and I've included a copy of a screen dump of the active working PUFF file titled NE4583D. See Figure 1 for details of the PUFF programming screen. Figure 2 is the laser printer copy of the PUFF output circuit board file for a low noise design for demo only.

This file was one of the first test plots of a design that had high peaked gain at our design frequency. Other designs gave less gain, but provided a very flat, broad response. I will cover the startup difficulties we experienced, and go through a complete design approach, including surface mount components (chip capacitors). Also, I'll cover the selection and cover differences between various components used in the construction of microwave amplifiers vs. low frequency chip components. The following month, I will get into the use of PUFF and some actual design methods that we used to construct working amplifiers. That should give you time to obtain a copy of PUFF so you can design a circuit for your own device. Order a copy of PUFF from Cal Tech. Cost is $10, foreign orders add $5 per item. Make checks payable to Cal Tech. Specify 5-1/4" or 3-1/2" diskette. Send your order to PUFF Distribution, Electrical Engineering, M/S 116-81, California Institute of Technology, Pasadena CA 91125.

As always, I will be glad to answer questions concerning microwave and related VHF/UHF topics. Please enclose an SASE for prompt reply. 73 Chuck WB6IGP

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RANDOM OUTPUT

David Cassidy N1GPH

My HF station is very modest. My main antenna is a homemade dipole, strung between a tree and the peak of the roof, with a two-conductor feedline. A low cost tuner allows me to get out a signal on 80 through 10 meters. I don't have any fancy amplifiers or processors. My signal is strictly barefoot.

I was scanning around the bands the other day when I heard the beginnings of a pile-up on 17 meters. Nothing too exotic, just Columbia. I'm not what you'd call a DX chaser. I keep track of the countries I've worked, but I don't bother with the QSL cards (unless the DX station needs New Hampshire, or my county) or any awards program. I know what I've worked, and that's enough for me.

I usually give it three or four tries, and if I haven't made contact by then I move on. I've read most of the books on DXing, so I'm familiar with most of the techniques, like waiting for the din to die down before transmitting my call or spotting the frequency of the last station worked.

Since I hadn't worked Columbia on 17 meters yet, I threw my call into the fray. A couple of "big guns" had moved into the pile-up, their high-powered, over-processed signals wiping out all other transmissions. Imagine my surprise when the DX came back to me—on my first try! No matter how rare or common the DX is, snagging him on the first try is truly one of the simple pleasures of amateur radio.

Later that afternoon, toward the high end of the same band, I came across a much larger and more frantic pile up. All the big guns were there, calling on top of each other, and calling on top of the DX station after he had already gone back to someone—chaos. It took me three or four minutes before I could get the DX station's callsign. It was South Africa. I didn't have South Africa on ANY band. It would be a totally new country for me, so I decided to try a few calls.

I listened for several minutes, trying to discern a pattern in how the DX was answering calls. He was only answering people on his frequency, so going a bit high or low wouldn't help. He didn't seem to be picking the last callsign heard in the din, so tail-ending wouldn't help. He also wasn't necessarily answering the loudest signals, so power wasn't going to help anybody. After listening to about a dozen contacts, I noticed that he wasn't ending his transmissions with the typical "73, thanks for the contact, QRZ." He was delaying his final transmission a bit, after the station he was working gave his name, QTH and signal report. He was listening for a callsign there. He'd then come back with "73, thanks for the contact, W1XYZ you're 5 and 8." Since most people started calling on top of him as soon as he said 73, they never knew that he wasn't even listening for a call when he unkeyed his mike. In fact, the person he was calling usually didn't hear him either, until the frantic shoutings of about a thousand other hams died down enough for the South African to repeat the transmission. Now that I knew his system, it was time to see if I could make the contact.

As soon as the station being worked said "over," I threw out a quick "November One Golf Papa Hotel." He came back with a "QSL five and nine, 73 and thanks..." That was all I heard, because as soon as he said "73," the pile-up started shouting. I didn't do anything except listen. As the noise died down, he came back loud and clear..."Golf Papa Hotel, you're five and nine, nice signal, over."

I didn't believe it! Snagged him! With only one transmission! Twice in one day! With about 90 watts and a dipole at about 20 feet! And I even got a "nice signal" from him!

I haven't related this story to demonstrate my prowess as a DXer. To be sure, this is the only time this has ever happened to me, and I don't expect it to happen again any time soon. I realize that luck had a lot to do with both contacts. After all, propagation has an awful lot to do with who a DX station can or cannot hear.

I've told you this story because my mail has been lately filled with letters from people who either complain about the high cost of hamming, or they complain about how Novices and anyone else with relatively modest stations can't work DX or contests. Poppycock!

Sure, you can't expect to pull the rare ones out of a pile-up on the first try. But you CAN expect to work them consistently if you use the two pieces of gear that cost you nothing—your eyes and your ears.

Have you read *The Complete DXer?* That, or any other book on DXing, will give you all the information you need. It never ceases to amaze me when I hear dozens of stations blindly calling a DX station without following even the most basic operating techniques (let alone the basic courtesy). It's not as if the information contained in these books is classified. If you haven't cast your eyes on any books about DXing, you're already placing yourself at a disadvantage.

It also amazes me when I hear stations calling in a pile-up who are obviously not listening to what's happening on the frequency. The DX station will say, "calls with a one only," or "calls ending in Bravo," and invariably there will be a handful of dummies who will not listen to what the DX is asking for. How many times have you heard a DX station start a QSO with someone, while three or four hams continue to send out their callsigns every three seconds? Like most things in life, you'll learn more if you spend more time listening than you do talking.

There's plenty of SSB DX on the Novice portion of 10 meters, and you don't need high power or a $10,000 station to work them. The other HF bands open to Novices are crawling with CW DX just waiting for you to work. A coupla' hundred bucks and a home-brew antenna is all it takes.

I have to admit, there's another reason why I told you the above story. I was so excited, I just HAD to tell someone! 73

Number 28 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
P.O. Box 1079
Payson AZ 85541

Old Sol has fooled us again! It now appears that present sunspot Cycle 22 will exhibit a *double*peak before finally sliding to its nadir. A chart of smoothed sunspot numbers seems to indicate such a phenomenon. Looking at a chart of solar cycles from 1760 to the present, it appears that a double peak seems to occur on every even-numbered cycle *since* Cycle 12 (1878–1889), *but not before then,* all the way back to Cycle 1 (1754–1765)! Why this should be, I do not know—but it is interesting, to say the least!

March will provide some excellent worldwide DX on Good ("G") days (see the calendar) from dawn to after dark on the HF bands between 20 and 10 meters. More Poor ("P") days appear to occur during the first half of the month: that is, the 1st, 6th, and 7th, and the 12th and 13th. During the last half of the month, only the 23rd appears to be a Poor ("P") day. Your best DX opportunities are expected to take place between the 16th and 20th, and between the 25th and 31st. The rest will be Fair ("F"), trending either way.

On Good days, the HF bands will be open from dawn until after dark, and you can expect long and short path DX (particularly mornings and afternoons) as well as short skip within the U.S. and its neighbors to north and south.

Because thunderstorms begin at this time of year, the bands below 20 meters (30 through 160) will have to deal with atmospheric noise, but when they are quiet, good opportunities for DX, particularly during hours of darkness, will occur.

Use the charts to plan your DX work, and listen to WWV at 18 minutes after any hour for the solar-terrestrial report. The K index (indicator of magnetic field conditions) and the A index (indicator of signal absorption) should below, while the solar flux (indicator of ionospheric conditions) should be high for best operating conditions.

Interestingly, during those days marked Poor, you may also find other evidences of upsets in the atmosphere and in the earth. Check it out—just for fun!

By the way, during the equinoxes (equal night and day), grayline DXing seems to be at its best, and signals along the line of the terminator (path of darkness) are particularly good. Try it. See you next month. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	10/15
ARGENTINA	15	15/20	20	40	40	—	—	10	—	—	10/15	10/15
AUSTRALIA	10/15	20	20	20	20	40	20/40	20	—	—	—	10/15
CANAL ZONE	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
ENGLAND	20	40	40/80	40/80	40	—	—	15	10	15	15	20
HAWAII	10/15	15	20	20	20/40	20/40	20	20	—	—	—	10/15
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	10/15
MEXICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	10/15	10	—	—	15
PUERTO RICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
SOUTH AFRICA	20/40	40	20	20	—	—	—	—	10	10	15	15
U.S.S.R.	40	40/80	20	20	—	—	—	10/15	10/15	—	20	20
WEST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	15	20	20	20	—	20(1)	20(1)	—	—	—	10/15
ARGENTINA	15	15	20/40	20/40	20	—	—	10	—	—	10	10/15
AUSTRALIA	10/15	15	15	—	20	20/40	40	20(1)	—	—	15(1)	10
CANAL ZONE	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
ENGLAND	40(1)	40/80(1)	40(1)	—	—	—	—	—	15*	15*	20	20
HAWAII	15	15	15	20	20	20/40	40	20	—	10	10	10
INDIA	15(1)	15/20(1)	—	—	—	—	—	15/20(1)	15(1)	—	—	—
JAPAN	10/15	15	20	20	20	—	20(1)	20(1)	—	—	—	10/15
MEXICO	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
PHILIPPINES	10/15(1)	—	20(1)	20(1)	—	—	—	—	10/15(1)	10/15(1)	—	—
PUERTO RICO	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	15/20	20
U.S.S.R.	—	—	—	—	—	—	—	15(1)	15(1)	15(1)	20	20

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	10/15	15	20	20	20	—	20	20	—	—	15
ARGENTINA	10/15	15	15	20	20	—	—	—	—	—	10	10
AUSTRALIA	10	10/15	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	15/40	20/40	20/40(2)	—(2)	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	15/20	20
HAWAII	10/15	10/15	15	15/20	20/40	20/40	40	—	15	10	—	—
INDIA	—	15(1)	20	—	—	—	—	—	15/20(1)	15(1)	—	—
JAPAN	10/15	10/15	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	15/40	20/40	20/40(2)	(2)	—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	15/20	—	—
PUERTO RICO	10	15	15/40	20/40	20/40(2)	(2)	—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U.S.S.R.	20	—	—	—	20(1)	—	—	20(1)	20(1)	20	20	20
EAST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

* Try next higher band on "G" days. (1) Possible opening on this band on "G" days. (2) Try 80m.
Note A: Use values of 10/15 for 12m; 20 for 17m; 40 for 30m. Note B: This chart refers to the highest band possible at the time indicated. If no luck, try next lower band.

MARCH 1992

SUN	MON	TUE	WED	THU	FRI	SAT
1 P	2 P–F	3 F	4 F	5 F–P	6 P	7 P
8 P–F	9 F	10 F	11 F–P	12 P	13 P	14 P–F
15 F	16 F–G	17 G	18 G	19 G	20 G–F	21 F
22 F–P	23 P	24 P–F	25 F–G	26 G	27 G–F	28 G–F
29 G–F	30 F–G	31 G				

Number 29 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check /HAMFESTS on our BBS (603-525-4438) for listings that were too late to get into publication.

MAR 1

NORTHAMPTON, MA The MTARA Fleamarket will be held at Smith Vocational School starting at 9 AM. Handicap accessible. VEC Exams. Tables $12 in advance, $15 at the door. $3 admission fee; under 12 free. Talk-in on 146.94, 146.52, 223.82. Contact ***N1CDR, 6 Laurel Terr., Westfield MA 01085; (413) 562-1027.***

MAR 7

DENVILLE, NJ The Split Rock/West Morris Hamfest will be held at Morris Catholic High School from 8 AM-2 PM. Talk-in on 146.985−, 146.52S, 223.860−, 447.075− (P.L. 88). Contact ***Bernie WB2YOK, (201) 584-5399.***

MAR 7-8

CHARLOTTE, NC The Mecklenburg ARS will sponsor the Charlotte Hamfest/ComputerFair at the Charlotte Merchandise Mart from 9 AM-5 PM Sat., and from 9 AM-2 PM Sun. VEC Exams by the Charlotte VEC on Sun. Advance tickets $6, $8 at the door. Children under 12 free. Tables $18 (in advance only). Write to ***Charlotte Hamfest, PO Box 221136, Charlotte NC 28222-1136,*** or call ***(704) 536-7373,*** for ticket and table info; ***(704) 568-7611*** for dealer and manufacturer info. Talk-in on W4BFB/r on 144.69/145.29.

MAR 12

CIRCLEVILLE, OH A Hamfest sponsored by the TEAYS ARC, will be held at the Pickaway County Fairgrounds from 8 AM-3 PM. Admission is $4 per person. Tables are $5 in advance, $6 at the door. Contact ***Dan Grant W8UCF, 22150 Smith Hulse Rd., Circleville OH 43113; (614) 477-3026.*** Talk-in on 147.78 and simplex 146.52.

MAR 14

CONNECTICUT The Annual RAS of Norwich Auction will be held at the Senior Citizens Center, Waterford Municipal Complex (Rt. 85, south of Exit 77 of I-395, or north of Exit 82 of I-95) from 10 AM until sold out. Setup at 9 AM. Free admission. Wheelchair accessible. Bring your equipment to be auctioned. Talk-in on 146.67 repeater. Contact ***KA1BB at (203) 739-8016.***

FLEMINGTON, NJ The Flemington Hamfest 1992, sponsored by the Cherryville Repeater Assn. II Inc., will be held at the Hunterdon Central High School Fieldhouse, Routes 31 and 523, from 8 AM-2 PM. Limited tailgating. Free parking. VE Exams. Wheelchair access. Vendor's tables $15 with quantity discount. Buyers admission $5. Unlicensed spouses and kids free. Talk-in on 147.375+. For reservations and info: ***Marty Grozinski NS2K, c/o CRA II, PO Box 308, Quakertown NJ 08868***. Or call ***(908) 806-6944*** before 11 PM. For VE registration call ***Dick Wells KE2HQ, (908) 479-6395,*** before 11 PM.

HUDSON, NH The Interstate Repeater Society will sponsor a Fleamarket at the Lions Club Hall, Lions Ave., from 8 AM-3 PM. Free parking. Buyers admission $2, sellers $10/space. Talk-in on 146.85. Contact ***Wayne KA1MKH, (603) 895-9035***. To reserve spaces, a check by Mar. 1 to ***IRS, PO Box 693, Derry NY 03038.***

TEXARKANA, TX The Four States ARC will host its 3rd annual Hamfest at the YWCA Bldg., 3410 Magnolia, from 8 AM-4 PM, rain or shine. Admission $2. Tables $5. Free Parking. VE Exams. Talk-in on 146.62. Contact ***Pat KG5SC, (903) 793-3677*** (eves.); or ***Travis K5AVH, (903) 792-2080.***

MAR 14-15

MIDLAND, TX The Midland ARC will hold their annual St. Patrick's Day Swapfest from 9 AM-5 PM Sat., and from 8 AM-2:30 PM Sun., at the Midland County Exhibit Bldg. located on E. Hwy 80. Advance tickets $5, $6 at the door. Tables $8. VE Exams ar 12 noon on Sat. Contact ***MARC, PO Box 4401, Midland TX 79704***

MAR 20-22

SCOTTSDALE, AZ The Scottsdale ARC will host a 3-day No-Code Technician License class, presented by Loraine McCarty N6CIO. Pre-registration is required. Contact ***Loraine, (714) 979-CODE*** days; or ***(714) 556-4351*** eves./weekends.

MAR 21

SCOTTSDALE, AZ The A.R.C.A. Spring Hamfest, hosted by the Scottsdale ARC, will be held from 7 AM-4 PM at Scottsdale Community College (east parking lots), 9000 E. Chaparral Rd. Admission is $2 per car for general parking, or $5 per swap space. Overnight parking for self-contained RVs Fri. and Sat. VE Exams ($5.40 ARRL/VEC) at 10 AM. Walk-ins OK. Contact ***Walt N7IZM, (602) 947-0338*** or write to ***S.A.R.C. Hamfest, PO Box 10878, Scottsdale AZ 85271-0878.*** Part of proceeds will be donated to the Scottsdale Comm. College Scholarship Fund.

MARSHALL, MI The 31st Annual Michigan Crossroads Hamfest, co-sponsored by the Southern Michigan ARS and the Marshall High Photo Electronics Club, will be held at the Marshall High School from 8 AM-3 PM. Setup at 6 AM. Tickets $2 in advance (SASE), $3 at the door. Free parking. Tables: Min. 4 ft./$.75 per foot. Send payment with SASE to ***SMARS, PO Box 934, Battle Creek MI 49016*** or call ***Wes Chaney N8BDM, (616) 979-3433.*** Pre-register before Feb. 21 for License Exams (no walk-ins). Include 610 form, SASE and $5.25. Make check or MO payable to **ARRL VEC** and send to ***SMARS, PO Box 934, Battle Creek MI 49016.*** Exams start at 9:30 AM.

MAR 21-22

FORT WALTON BEACH, FL The Playground ARC will hold their 22nd annual Ham/Swapfest at the Ft. Walton Beach Fair Grounds from 8 AM-5 PM. Tables $10 one day/$15 both days; (call ***Len, WD4KKV, (904) 862-5771***) For RV parking with hookups and dump, call ***Tony KC4YBE, (904) 581-0156.*** For commercial space, meetings, forums, contact ***P.A.R.C., PO Box 873, Ft. Walton Beach FL 32549.***

MAR 22

BRISTOL, CT The Insurance City Repeater Club will hold its annual Hamfest/Computer Fleamarket from 9 AM-2 PM at the Bristol Eastern High School. General admission $3. Free parking. Prepaid tables $15; $20 at the door. Contact ***Chuck Motes K1DFS, 22 Woodside Ln., Plainville CT. (203) 747-6377.*** Talk-in on 146.88, 224.80. License Exams by pre-registration only. Write with SASE to ***ICRC, PO Box 165, Pleasant Valley CT 06063.***

BRAINTREE, MA The South Shore ARC will hold its annual indoor Fleamarket at the Viking Club, 410 Quincy Ave., from 10:30 AM-3 PM. Admission $1. Free parking. 8′ tables for $12 each, includes 1 free admission per table if paid for before Mar. 18. Send payment to ***Thaire Bryant KA1MJR, 81 Saning Rd., N. Weymouth MA 02191.*** Tables cost $14 on fleamarket day. Make checks payable to the South Shore ARC.
For info call ***Thaire, (617) 331-3673***, eves.

MADISON, OH The 14th Annual Lake County ARA Hamfest will be held at Madison High School from 8 AM-3 PM. Admission $4 in advance (SASE and postmark by Mar. 7 please); $4.50 at the door. VE Exams. A two meter indoor fox hunt will begin at 1 PM. 6′ vendor tables are $6; 8′ tables are $7.50. Talk-in on 147.81/.21 or 222.90/224.50 (PL 141.3). Contact ***Roxanne, LCARA Hamfest, 5777 Fenwood Ct., Mentor-on-the-Lake OH 44060. (216) 257-2036*** from 6 PM-9 PM and 10 AM-4 PM weekends or ***(216) 352-6756*** weekdays from 10 AM-4 PM.

MILTON-FREEWATER, OR The Walla Walla Valley ARC will sponsor a Swapfest at the Community Bldg. from 8 AM-4 PM. License Exams. Free admission. Indoor swap tables $5. Contact ***Carl Elsner N7PVW, (509) 522-1270.*** Talk-in on 147.28/.88.

JEFFERSON, WI The Tri-County ARC will hold its annual Hamfest at the Jefferson County Fairgrounds starting at 8 AM. Admission $4. 6′ tables are $4 each. Monies will provide a scholarship to a second-year electronics student from the Tri-County area. Contact ***W9MQB, 213 Frederick St., Fort Atkinson WI 53538. (414) 563-6381*** eves.

STERLING, IL The Sterling-Rock Falls ARS 32nd annual Hamfest will be held at the Sterling High School Field House, 1608 4th Ave. Free parking. Areas for self-contained campers and RVs overnight. Tickets $3 in advance, $4 at the door. Tables, w/electricity, are $5 (bring your own cord). Talk-in on 146.25/.85 W9MEP repeater. Contact ***Sue Peters, Sterling-Rock Falls ARS, PO Box 521, Sterling IL 61081. (815) 625-9262.***

MAR 27

ELIZABETHTOWN, KY The Lincoln Trail ARC will hold their 13th annual Hamfest at Pritchard Community Center starting at 0800 AM. Setup at 6 PM. Advance tickets $4, $5 at the door. Advance reservations for fleamarket and new vendors will be $5 per table and chair ($10 the day of the Hamfest). VE Exams, walk-ins. Copy of license and original required. Exam contact: ***Chuck Strain AA4ZD, (502) 351-1715.*** Reservations contact: ***Whitey Hensley WD4GDA, PO Box 342, Vine Grove KY 40175. (502) 877-2234*** (day or night). Doors will open at 0800 AM the day of the Hamfest.

MAR 29

MONROEVILLE, PA The TRARC Hamfest/Computer Fest will be held at Expo Mart, RT 22, from 8 AM-4 PM. Admission $4 at the door. Children under 12 free with adult. Directions on 146.73. Talk-in on 146.52. Tables are $10 ea. Contact ***Jim AG3H, (412) 373-2536*** for tables.

MILFORD, CT All Class Exams by the Coastline Amateur ARA, will be held at the Fowler Bldg., 145 Bridgeport Ave., at 12 noon. Walk-ins welcome. Contact ***Gary NB1M, (203) 933-5125,*** or ***Dick WA1YQE, (203) 874-1014.***

MICHIGAN CITY, IN The Michigan City ARC, Inc. will hold their annual Spring Hamfest at Rogers High School, Pahs Rd., from 8 AM-2 PM (Central Standard Time). Setup at 7 AM. Admission $4 per person over 10 years of age. 8′ tables $5 each. Electricity $2. Contact ***Roy Jackson NY9B, PO Box 2013, Michigan City IN 46360. (219) 872-4201.***

SPECIAL EVENT STATIONS

MAR 7

CENTRAL FLORIDA The Lake ARA will operate K4FC on 10, 15, and 20m at 28.365, 21.375 and 14.265 from 1200Z-2200Z, to celebrate their 40th Anniversary. For QSL, send QSL and SASE to ***LARA, PO Box 1465, Tavares FL 32778.***

MAR 10-16

ANGUILLA/BRITISH WEST INDIES Lambda ARC President Jim Kelly KK3K, of Philadelphia PA, and Vice President Don Bledsoe WB6LYI, of Long Beach CA, will begin the first OSCAR operation from VP2E (Anguilla) and VP2V (British West Indies). Don will begin from Anguilla as VP2E/WB6LYI during Mar. 10-13. Jim will operate as VP2V/KK3K from Tortola Mar. 13-16. These DX countries have not been on-the-air on OSCAR-13 before.

MAR 13-15

SWEETWATER, TX The Nolan County ARC will operate a Special Event Station from 1500Z-2400Z Mar. 13-15 during the world's largest rattlesnake round-up. Operation will be in the 20 and 40m General phone bands plus 10m Novice. For certificate, send QSL and large SASE to ***WR5B, PO Box 825, Sweetwater TX 79556.***

MAR 14

LUSBY, MD The Southern Patuxent ARC will operate N3IFL during 1300Z and 2100Z to commemorate Albert Einstein's birthday. Operation will be in the lower portion of the General phone bands and the Novice 10m subband. The theme is nuclear energy. Baltimore Gas and Electric Co. is sponsoring the event at their Calvert Cliffs Nuclear Power Plant Visitors Center, which is open to the public. Certificates will be awarded to each plant that contacts at least five other plants and submits a copy of their station log. For a commemorative QSL card, send a QSL and SASE to ***Bob Smith N3IFL, 12480 Catalina Dr., Lusby MD 20657. (410) 260-6908.***

MAR 14-15

DAYTON, OH For the third year, the Farout ARC will operate Station WB8SMC/8 from St. Patrick (Shelby County) OH during 1800Z 14 Mar.-1800Z 15 Mar. Operation will be in the lower portions of 80, 40, 15, 10m Novice CW and Novice phone; 20m General CW, and 80, 40, 20, 15m General phone, as band conditions allow. The Farout ARC QSLs 100 percent to amateurs and SWLs. To QSL, send a business-size SASE to ***Farout ARC, PO Box 9181, Dayton OH 45409-9181.***

MAR 21-22

CHESAPEAKE, VA The Chesapeake ARS will celebrate the 1st anniversary of the C.A.R.S. Radio Shack, by operating the Club Station from 1400Z Mar. 21-1400Z Mar. 22. CW: 28.125, 21.125, 14.050, 7.130, 3.680. Phone: 28.385, 21.240, 14.250, 7.230, 3.870± QRM. Send 8½ x 11½ SASE to ***C.A.R.S., PO Box 2035, Chesapeake VA 23327.***

MAR 24-26

HAWAII VOLCANO NATIONAL PARK The Chariton (Iowa) High School ARC will operate Jean (WH6DZ) and Paul (W3FO) Stoner's totally solar-powered station from 1800Z-2400Z in conjunction with their DXpedition to promote amateur radio in schools, and to study the volcanic origin of the islands. Operation will be in the Novice 10m phone subband. For QSL, send QSL and SASE to ***Lawrence Wantland II N0HTK, Chariton High School ARC, 501 N. Grand, Chariton IA 50049.***

MAR 27-28

PHILADELPHIA, PA Members of the Warminster ARC will operate WA3DFU 2200Z Mar. 27-2200Z Mar. 28, at the Union League of Philadelphia, to honor all the soldiers who fought in the Civil War. Look for WA3DFU on 14.275, 21.375 and 28.375. For a certificate, send QSL and SASE to ***Warminster ARC, Box 113, Warminster PA 18974.***

MAR 28-29

MISSISSIPPI STATE, MS The Mississippi State U. ARC will operate Station W5YD from 1800Z Mar. 28-0600 Mar. 29, to commemorate 100 years of engineering at Mississippi State U. Operation will be SSB in the General 40m and 20m and the Novice 10m subbands. For a certificate, send a QSL and SASE to ***W5YD, PO Box 591, Mississippi State MS 39762.***

Uncle Wayne's BookShelf

REFERENCE

20N101 **Everyday Electronics Data Book** *by Mike Tooley BA.* Information is presented in the form of a basic electronic recipe book with numerous examples showing how theory can be put into practice using a range of commonly available 'industry standard' components and devices. 256 pp. 134 line drawings. **$18.00**

20N102 **Practical Digital Electronics Handbook** *by Mike Tooley* contains nine digital test gear projects, CMOS, and TTL pinouts and tables or reference data. Introduces digital circuits, logic gates, bistables and timers, microprocessors, memory and input/output devices, before looking at the RS-232C interface and the IEEE-488 and IEEE-1000 microprocessors buses. 208 pp., 100 line drawings. **$14.50**

20N103 **Electronic Power Supply Handbook** *by Ian R. Sinclair* covers many types of supplies—batteries, simple AC supplies, switch mode supplies and inverters. All types of supplies used for electronics purposes are covered in detail, starting with cells and batteries and extending by way of rectified supplies and linear stabilizers to modern switch - mode systems, IC switch - mode regulators, DC-DC converters and inverters. 144 pp., 90 line drawings. **$16.25**

20N104 **Electronic Test Equipment Handbook** *by Steve Money* is a guide to electronic test equipment for the engineer, technician, student and home enthusiast. Provides a practical guide to widely used electronics instruments and the techniques of measuring a wide range of parameters in electronics systems. 216 pp., 123 line drawings. **$18.00**

20N105 **Digital Logic Gates and Flip-flops** *by Ian R. Sinclair*, what they do and how to use them. Seeks to establish a firm foundation in digital electronics by treating the topics of gates and flip-flops thoroughly and from the beginning. For the user who wants to design and troubleshoot digital circuitry with considerably more understanding of principles than the constructor, and who wants to know more than a few rules of thumb about digital circuits. 204 pp., 168 line drawings. **$18.00**

02C30 **The Commodore Ham's Companion** *by Jim Grubbs K9EI* 160 pages of useful information on selecting a Commodore computer for the ham shack, where to find specialized programs, the Commodore-packet connection, and more! **$9.50**

09D22 **The World Ham Net Directory** *by Mike Witkowski* New—second edition now over 600 net listings. This book introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

10F091 **1992 International Callbook** The new 1992 International Callbook lists 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$29.95**

10D091 **1992 North American Callbook** The 1992 North American Callbook lists the calls, names, and address information for over 500,000 licensed radio amateurs in all countries of North America, from Panama to Canada including Greenland, Bermuda, and the Caribbean islands plus Hawaii and U.S. possessions. **$29.95**

05H24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. Indepth study of AC/DC fundamentals, SSB, antennas, amplifiers, power supplies, and more. **$29.50 hard cover only**

20N107 **Ham Stuff—The Who—What—Where of Amateur Radio** *by Walt Garrett* This is the indispensable new guide to everything in Ham Radio. If you want to know who's on first and what's what, this valuable guide belongs in your shack. You'll refer to it again and again to find just the right equipment, where to shop, and who to call. Everything from radios to QSL cards to hat pins, complete with product descriptions, vendor profiles, prices, and more. **$19.95**

12E76 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Thoroughly revised in 1972. Covers the important aspects of applied electronics and electronics communications. 567 pp. **$10.95**

12E41 **Second Level Basic Electronics** *Prepared by the Bureau of Naval Personnel* Sequel to *Basic Electronics*, thorough treatment of the more advanced levels of applied electronics, Includes microwave receiving and transmitting. Hundreds of excellent diagrams. 325 pp. **$7.50**

01D45 **The Illustrated Dictionary of Electronics, 5th Ed.** *by Rufus P. Turner and Stan Gibilisco* Featuring more than 27,000 entries, an exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables, this is by far the most comprehensive dictionary of practical electronics and computer terms available. 720 pages **$26.95**

04M54 **GGTE Morse Tutor** From beginner to Extra class in easy self-paced lessons. Code speeds from 1 to over 100 words per minute. Standard or Farnsworth mode. Adjustable tone frequency. Create your own drills, practice or actual exams. Exams conform to FCC requirements. 5¼ floppy for IBM PC, XT, AT, PS/2 or compatibles **$19.50**

04M55 **Advanced Edition $29.95**

20N091 **Most-Often-Needed Radio Diagrams and Servicing Information, 1926-1938, Volume One** *compiled by M.N. Beitman*
An invaluable reference for anyone involved in Vintage Radio restoration. Hundreds of schematics, writing diagrams and parts lists, all from the original sources. **$11.95**

20N096 **How To Read Schematics (4th edition)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. This book is your key to unlocking the mysteries of schematics, beginning with a general discussion of electronic diagrams. **$14.95**

20N097 **Radio Operator's World Atlas** *by Walt Stinson, W0CP*
This is a compact (5x7), detailed, and comprehensive world atlas designed as a constant desk top companion for radio operators, and as a replacement for the traditional bulky and outdated atlases. Also included are 42 pages of vital statistics about each country. Popular with DXers worldwide. **$17.95**

SHORTWAVE

06S57 **1992 Passport to World Band Radio** *by International Broadcasting Services, Ltd.* You can have the world at your fingertips. You'll get the latest station and time grids, the 1992 Buyer's Guide and more. 384 pages. **$16.50**

03S11 **Shortwave Receivers Past and Present** *edited by Fred J. Osterman* Concise guide to 200+ shortwave receivers manufactured in the last 20 years. Gives key information on each model including coverage, display, circuit type, performance, new value, used value, etc. Photos on most models. The Blue Book of shortwave radio value. 1987, 104 pages, 8½ x 11. **$8.95**

07R25 **The RTTY Listener** *by Fred Osterman* New and expanded version. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter*. It contains up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. 224 pages. **$19.95**

03C09 **Shortwave Clandestine Confidential** *by Gerry L. Dexter* Covers all clandestine broadcasting, country by country: tells frequencies, other unpublished information: spy, insurgents, freedom fighters, rebel, anarchist radio, secret radio. Current publication. 84 pages. **$8.50**

03M221 **US Military Communications (Part 1)** Deals with US Military communication channels on shortwave. Covers frequencies, background on point to point frequencies for the Philippines, Japan and Korea, Indian and Pacific Oceans, and more. 102 pages. **$12.95**

03M222 **US Military Communications (Part 2)** Covers US Coastguard, NASA, CAP, FAA, Dept. of Energy, Federal Emergency Management Agency, Disaster Communications, FCC, Dept. of Justice. From 14 KC to 9073 KC. 79 pages. **$12.95**

03M223 **US Military Communications (Part 3)** This part completes the vast overall frequency list of US Military services, from 8993 KC to 27,944 KC. 78 pages. **$12.95**

09S42 **The Scanner Listener's Handbook** *by Edward Soomre N2BFF* Get the most out of your scanner radio. Covers getting started, scanners and receivers, antennas, coaxial cable, accessories, computer controlled monitoring, more. **$14.95**

03S208 **Radioteletype Press Broadcasts** *by Michael Schaay* Covers schedules of Press Services by time, frequency, and country broadcasting in English, French, German, Spanish, and Portuguese. Detailed Press Agency Portraits. 120 pp. **$12.95**

11T88 **Tune in on Telephone Calls** *by Tom Kneitel K2AES* Formatted as a frequency list with detailed description of each service and its location in RF spectrum. Provides basic information for casual listeners getting started and details for ardent enthusiasts. **$12.95**

03K205 **Guide to Radioteletype (RTTY) Stations** *by J. Klingenfuss* Updated book covers all RTTY stations from 3MHz–30MHz. Press, Military, Commercial, Meteo, PTTs, embassies, and more. 105 pp. **$12.95**

11AS10 **Air Scan Guide to Aeronautical Communications (5th Edition)** *by Tom Kneitel K2AES* Most comprehensive guide to monitoring aeronautical communication in the US. Expanded to cover all Canadian land airports and seaplane bases, plus listings for Central America, the Caribbean, North Atlantic, and the Pacific Territories. **$14.95**

07A66 **Aeronautical Communications Handbook** *by Robert E. Evans* Exhaustive, scholarly treatment of shortwave aeronautical listening. Well organized, up-to-date. 266 pp. **$19.95**

07R20 **A Radio Journal 1912–1940** *by Russ Rennaker W9CRC* A fascinating trip through time. Easy to read and informative, educational and entertaining. A trip down memory lane to the early days of radio. **$7.95**

11RF13 **The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.)** *by Tom Kneitel K2AES* This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. 25 to 470 MHz. **$19.95**

11F52 **Ferrell's Confidential Frequency List** *compiled by A.G. Halligey* All frequencies from 4MHz–28MHz covering ship, embassy, areo, Volmet, Interpol, numbers, Air Force One/Two, more 376 pp. **$19.50**

11SR97 **National Directory of Survival Radio Frequencies** *by Tom Kneitel K2AES* Handy and concise reference guide to high interest communications frequencies required by survivalists. Includes chapter on building emergency communications antenna systems. **$8.95**

11SM11 **Scanner Modification Handbook, Vol. 1** *by Bill Creek* Provides straightforward step-by-step instructions for expanding the operating capabilities of VHF scanners. Filled with interesting text, helpful photos, tables, and figures. **$17.95**

11EE06 **Guide to Embassy Espionage Communications** *by Tom Kneitel K2AES* Candid and probing examination of worldwide embassy and (alleged) espionage communication systems and networks. Extensive nation-by-nation directory of embassy stations is included. **$10.95**

15D91 **1992 Shortwave Directory (7th ed.)** *by Bob Grove* Extensively revised, the new 1992 Shortwave Directory is the consummate DXer's bible for the first 30 MHz of radio spectrum, including up-to-date and accurate VLF information as well. 270 information-packed and illustrated pages in convenient 8½ x 11 format professionally bound. **$21.95**

20N093 **Vintage Radio 1887-1929** *by Morgan E. McMahon* Recaptures the excitement of the early days. The authoritative reference book for historians and collectors. **$8.95**

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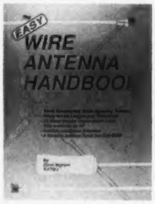

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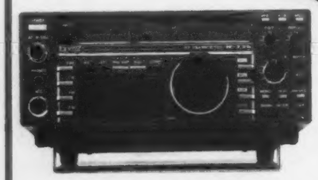
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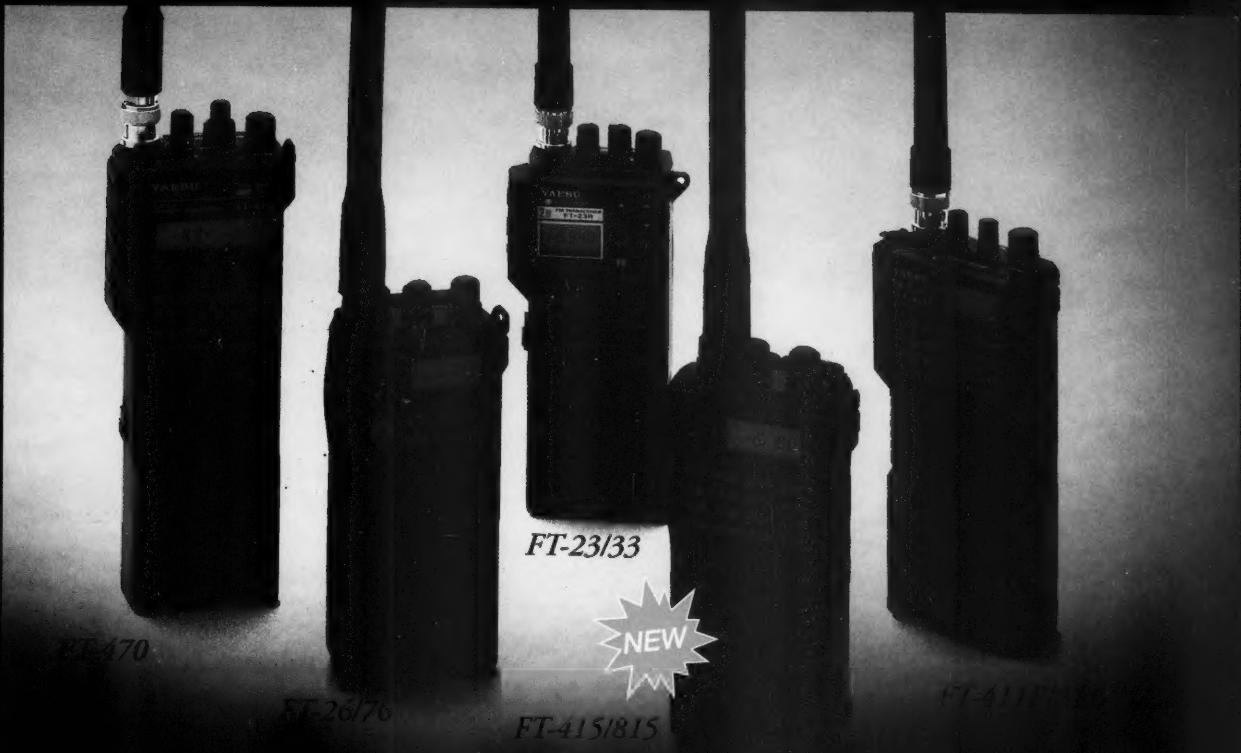

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